



# *The* Tool Engineer

.....

FLAME - CUTTING GEARS

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL  ENGINEERS

FEBRUARY, 1953

VOLUME XXX, NO. 2

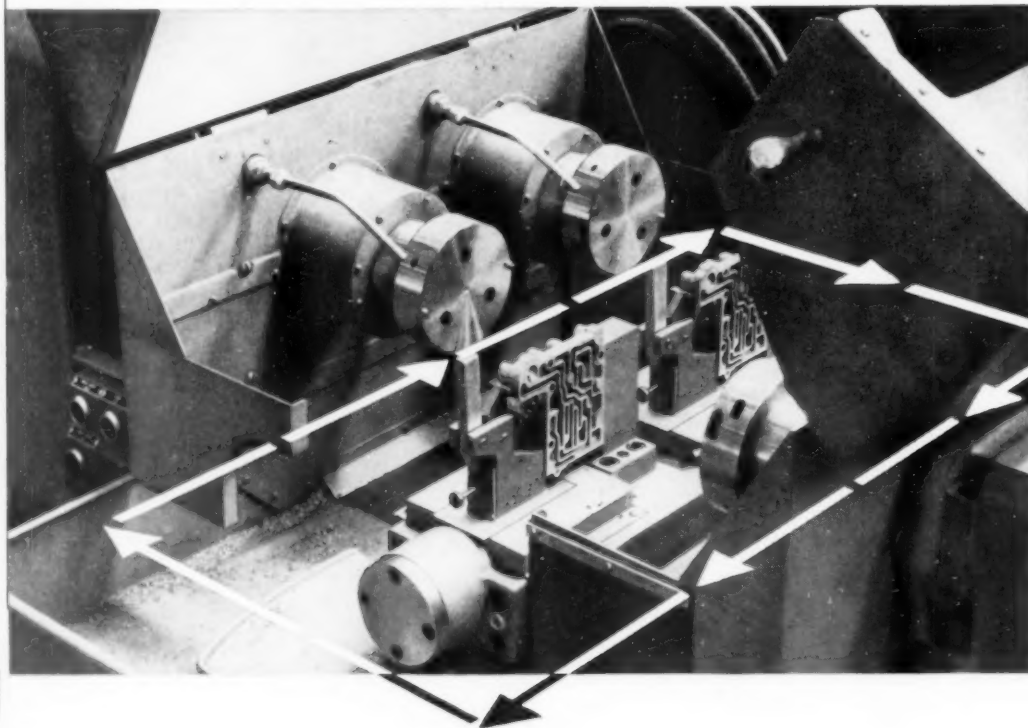
PLANNING  
ENGINEERING  
CONTROL

OF

TOOLING  
EQUIPMENT  
PRODUCTION

# Heald Bore-Matic speeds FLY-CUTTING

... gives extra precision, too



**Valve bodies fly-cut  
on both sides,  
two parts at a time,  
in fully automatic  
high-speed cycle**



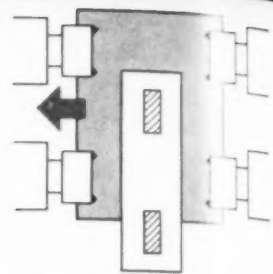
Case Study  
No. 2232-96 in

**PRECISION  
PRODUCTION**

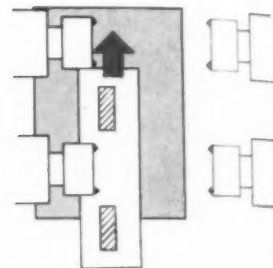
● Many people think of a Heald Bore-Matic only in terms of the conventional boring, facing, turning and chamfering operations. Yet these versatile machines can be equally well applied to a wide variety of other operations — take fly-cutting for example.

Here a model 222 Heald Bore-Matic combines fast automatic cycling with characteristic high precision. Two valve bodies are fly-cut simultaneously as they are indexed past the rotating quills with double tools mounted in the face. The machine is fully automatic, finishing both sides of two parts in a single machine cycle.

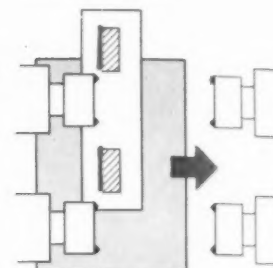
Remember — when it comes to precision finishing, it pays to come to Heald.



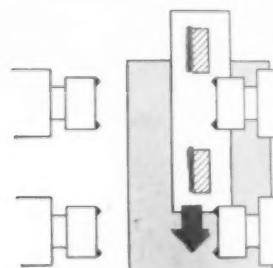
1. Parts loaded. Table rapid traverses left.



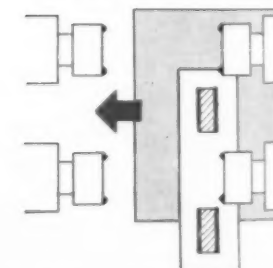
2. Cross slide feeds to rear. Heads fly-cut.



3. Table rapid traverses right.



4. Cross slide feeds forward. Heads fly-cut.



5. Table rapid traverses left to unloading position.

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

**THE HEALD MACHINE COMPANY**

**WORCESTER 6, MASSACHUSETTS**

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



Cover: Magnetic tracer head following template of gear segment to guide the torch of a flame cutting machine. How these gears are cut to an accuracy of 0.006 inch is discussed in R. E. Orton's article beginning on page 37.



# The Tool Engineer

Volume XXX, No. 2

February, 1953

## TECHNICAL ARTICLES

ASTE Leadership Conference (Editorial)	By L. B. Bellamy	35
Gears Cut by Guided Flame	By R. E. Orton	37
Gadgets		45
Form Tool Grinding Fixture	By H. J. Gerber	
Template Mask	By Gene K. Jordan	
Center-Drilling Jig for Brake Cylinders	By F. E. Riley	
Tool Drawings to Meet Shop Needs	By E. M. Hofmann	47
Tooling and Low Cost Production	By E. A. Cyrol	52
Improving Band Tool Performance	By M. A. Bergson	56
The Machinability of Cast Steels	By Norman Zlatin, John F. Kahles and Charles W. Briggs	59
Improved Plaster Tooling	By John Starr	67
Machining Aluminum (Reference Sheets)		70

## ASTE NEWS

Detroit Host for Society's 1953 Annual Meeting	By Nancy L. Morgan	74
Wilson Receives ASTE's Highest Honor		73

## DEPARTMENTS

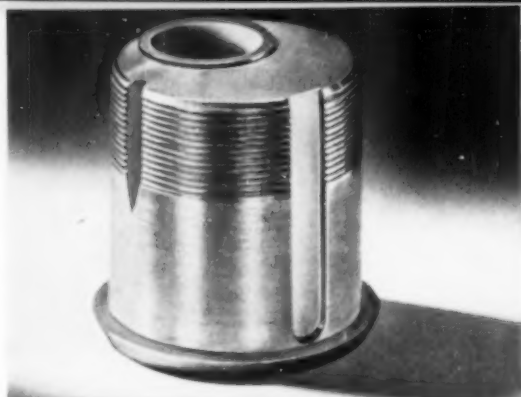
Abstracts of Foreign Literature,	132
Good Reading,	126
Letter from the Editor,	3
News in Metalworking,	88
North, East, West, South in Industry,	130

Technical Shorts,	137
Tools of Today,	90
Trade Literature,	128
Who's Meeting— and Where,	135
Advertisers Index,	224

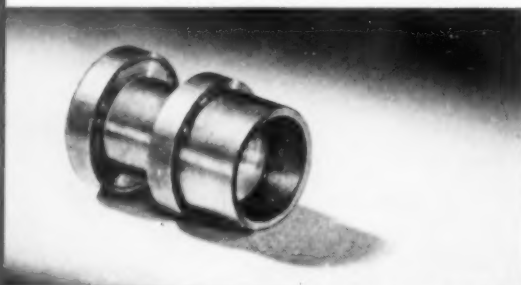
THE TOOL ENGINEER is regularly indexed in *The Industrial Arts Index*.

## AMERICAN SOCIETY OF TOOL ENGINEERS

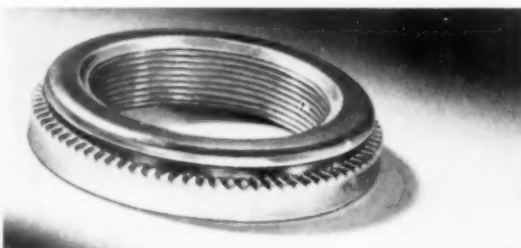
THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second-class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription for members, \$2.00. Non-members, \$6.00. Canada, \$6.50; all other countries, \$8.00 per year. Copyright 1953 by the American Society of Tool Engineers.  
OFFICE OF PUBLICATION: 239 E. Chicago St., Milwaukee, Wis.  
EXECUTIVE AND EDITORIAL OFFICES: 10700 Puritan Ave., Detroit 21, Michigan.



**LOCK CYLINDER.** Metal: 1 3/4" dia. brass  
• Machine: model 601 New Britain Gridley  
• Operations: *cross slide*—rough form, finish form, break down cut off, side mill, vertical end mill, final cut off; *tool slide*—face, drill offset hole, ream and counterbore offset hole, thread  
• Spindle Speed: 1,324 rpm • Feed: .006" per revolution • Tools: high-speed steel • Cycle Time: 7.3 seconds



**CARPENTER'S PLANE PART.** Metal: 9/16" B1113 steel • Machine: Brown & Sharpe Automatic Screw Machine • Operations: *front cross slide*—form; *rear cross slide*—cut off; *turret*—feed stock, spot drill, drill 1 1/2" hole, tap drill, reverse spindle and tap left-hand thread  
• Spindle Speed: 1,180 rpm • Feed: .0025" per revolution • Tools: high-speed steel • Cycle Time: 30 seconds



**KNOB INSERT.** Metal: 1 7/8" round aluminum  
• Machine: model 61 1 3/8" New Britain Gridley  
• Operations: *cross slide*—form, knurl, cut off; *tool slide*—spot drill, tap, ream, recess • Spindle Speed: 1,600 rpm • Feed: .005" per revolution • Tools: high-speed steel • Cycle Time: 7 seconds

**SUN OIL COMPANY, TE-2**  
Philadelphia 3, Pa.

I am having trouble possibly caused by an inadequate cutting oil. I would like ☐ the services of a Sun representative; ☐ the booklet "Cutting and Grinding Facts."

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Title

Company

Street

City  Zone  State



**MORE THAN 300 PARTS ARE MACHINED** with the aid of one cutting oil for tools and hardware items made by Sargent & Co. Raw materials worked are: B1113 steel, 11ST-3 aluminum, ASTM-B140-46 Type B half-hard bronze, B16-46 brass, and Type 416 stainless steel. Stock ranges from 1/16" wire to 2" bars.

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Sunicut 11W is a low-viscosity, dual-purpose cutting oil for automatics machining all nonferrous metals and free-machining steels such as B1112 or B1113. Its transparency permits quick and accurate miking. It will not stain brass or copper under normal conditions. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion.

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### THE TOOL ENGINEER

Publication of The  
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Tool Engineers  
10700 Puritan Ave.  
Detroit 21, Mich.



# The Tool Engineer

## Engineering for Service

When designing a tool for production, the engineer should always realize that he is creating a character or personality that will live with the tool throughout its useful life. As judicious care and thought are given to the selection or design of each part in an assembly, so will the usefulness and service rendered by the product be affected accordingly.

The engineer is not selecting merely a 10-24 or a 1/4-20 bolt to join two pieces of metal but is building a tool with a feeling that shouldn't limit its application needlessly or frustrate the user. If a part is to be operated or adjusted frequently, it should be so arranged that the physical and mental effort of the operator is not excessive. Insofar as possible, it should invite the operator to make the precise adjustment required.

Many knobs and dials may be proportioned generously and engraved clearly as an aid to the operator. Satin finishes are frequently employed to reduce glare on a graduated dial. Convenient location of pushbuttons and other controls allow the operator to make adjustments easily while observing performance, and are economical refinements that usually pay dividends.

In a machine requiring operator supervision, auxiliary lighting should not be an afterthought. Careful planning and location of lighting for critical seeing tasks are important and deserve more consideration than is usually given. General illumination should not be considered adequate. Much can still be done beyond the general practice of allowing the operator to provide makeshift lighting. More study of the problem from the viewpoint of operator convenience would no doubt prove economical and pay dividends in increased production and reduced rejects.

*John W. Greve*

EDITOR



**THEY CAN TAKE IT...and DO!**  
...and still maintain accuracy



**STANDARD**

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**This One Was New...**  
*Years Ago -*  
**Still Serviceable**

Obviously it has withstood hard usage, yet indicators such as these are constantly being reconditioned (at a fraction of the original cost) — to return still more dependable service to the owner.

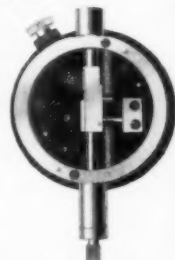
You wouldn't treat your watch the way some indicators have to be treated. Standard Dial Indicators are built to give continuing accuracy while standing the knocks.



**Outstanding Reason for the  
Durability Built into  
Standard Indicators is the**

**SHOCKPROOF  
MECHANISM**

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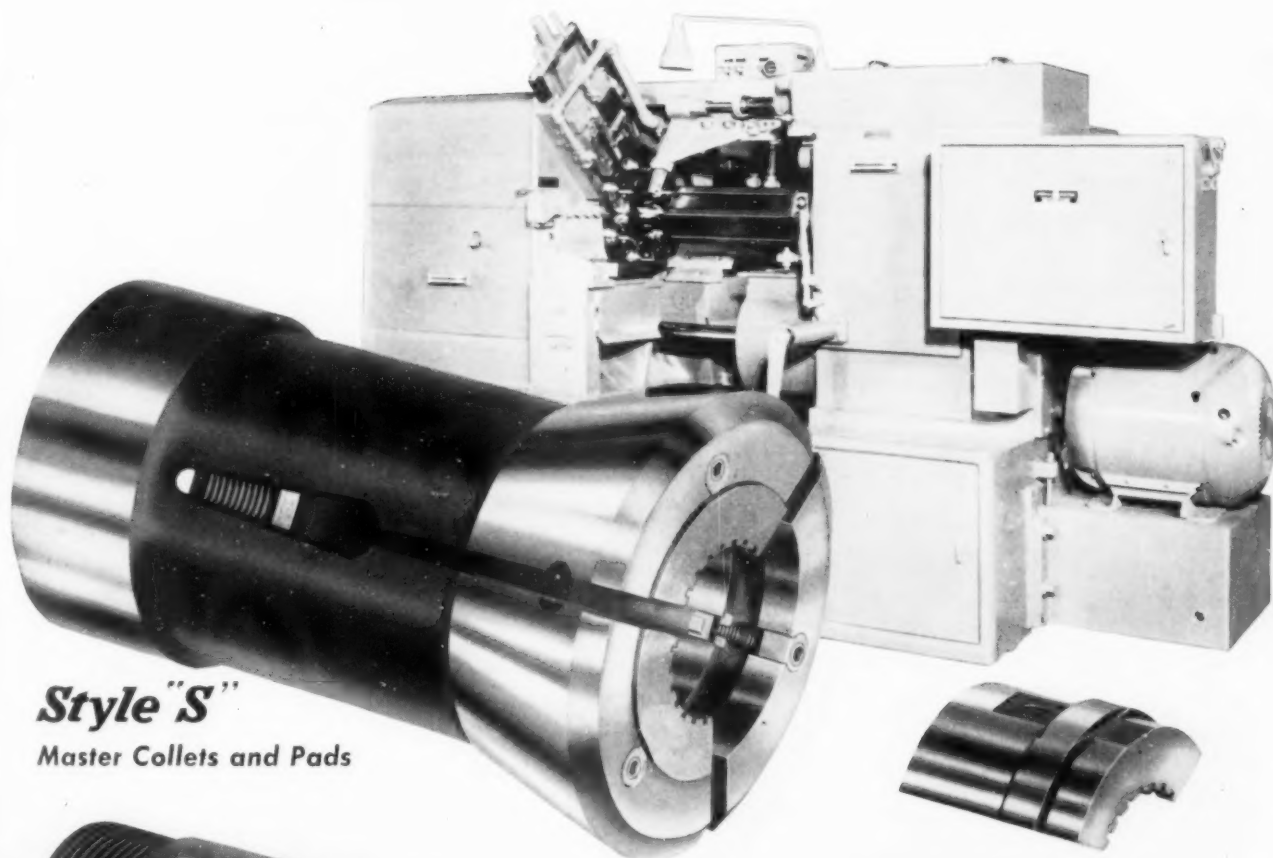
**STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.**

**HARDINGE**  
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On The Screw



***Style "S"***

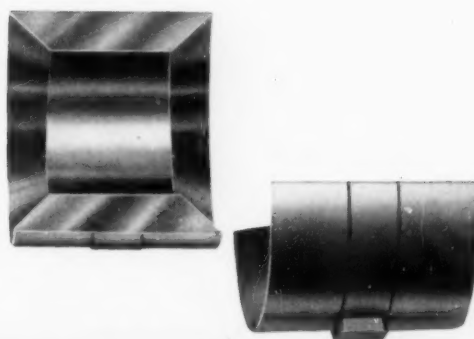
Master Collets and Pads



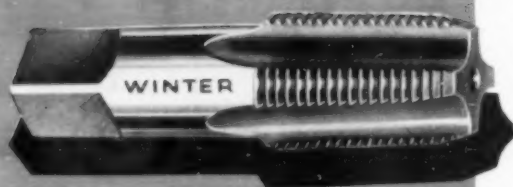
***Style "B"***

Master Feed Fingers and Pads

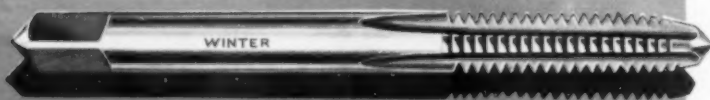
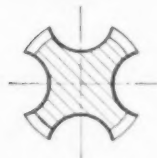
Pads Interchangeable Among  
Different Makes of Automatics



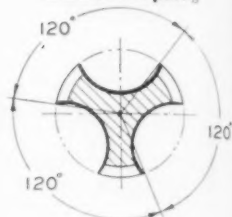
**HARDINGE BROTHERS, INC., ELMIRA, N. Y.**



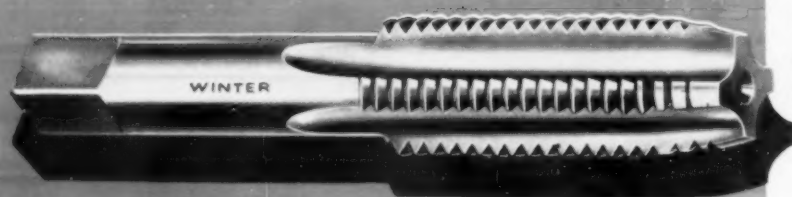
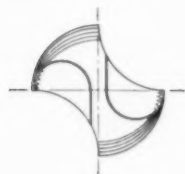
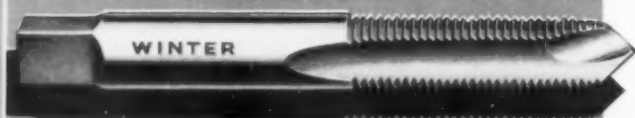
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FOR DEFENSE PRODUCTION

MACHINE CO.

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## Landmaco Machine Adapted for Threading U.S. Navy Rockets

A LANDMACO Threading Machine, through special tooling devised by our Engineering Department, was recently adapted for use by a southwestern manufacturer for the precision threading of 5" Mark 6 Navy Rockets.

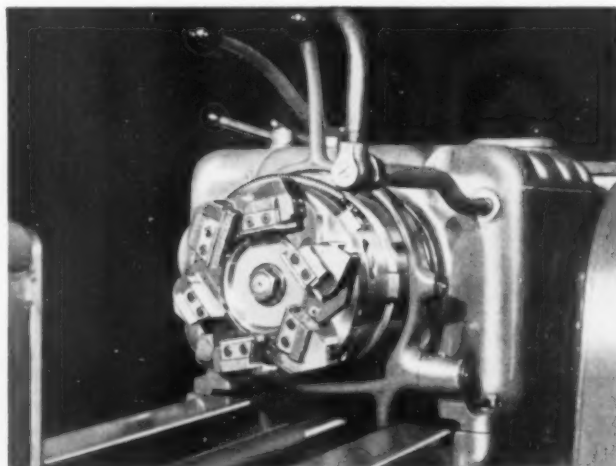
### JOB REQUIREMENTS:

Specifications required the generation of  $4\frac{3}{4}$ " diameter 12-pitch threads on the rocket head. As a result of the design of the rocket this threading operation had been a trouble spot in the manufacturing process.

Concentricity limits had to be held between thread and the section of the workpiece projecting in front of the thread. It had been difficult to maintain the exact tolerances required. One of the problems arose from the fact that the diameter of the forepart of the projection was larger than the root diameter of the thread. Detailed specifications and engineering drawings of the rocket head are not available for security reasons.

### THREADING EQUIPMENT USED:

Today precision threads are being cut on these rocket heads at high production rates, and the threads are held to close concentricity. A battery of three  $2\frac{1}{2}$ " Single Head LANDMACO Leadscrew Threading Machines are used in the operations, each equipped with Special Tooling devised to meet the problems of this specific job.

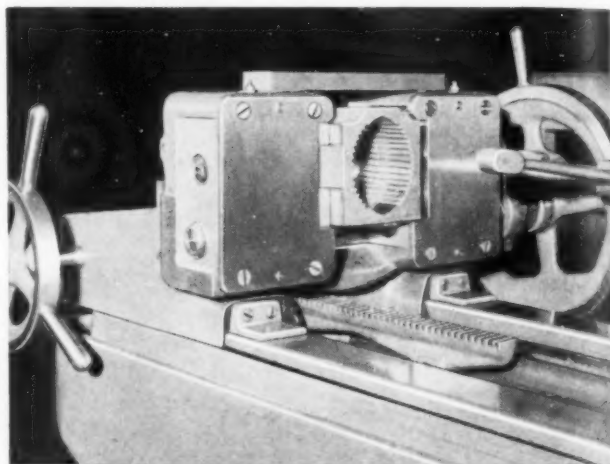


### SPECIAL TOOLING:

1. *40RX LANCO Head.* This head features the use of six chasers, thus distributing the cutting strains over a larger number of threading tools. This results in a finer thread finish and longer tool life.

2. *Receding-type centering pilot.* The bore of each head is fitted with this pilot to maintain close concentricity. The

pilot is slightly tapered so that it fits over the front end of the rocket head. Thus, before the work is gripped in the vise, it is engaged by the centering pilot while the head is



open. A relief between the start of the thread and the larger diameter of the projection provides the clearance necessary for the head to close.

3. *Heavy-duty Vise.* It is adjustable both vertically and horizontally. A metal tie is doweled and bolted to the top of the vise as reinforcement to assure maximum strength and rigidity. The vise has round, serrated grips, precision-ground to insure uniform gripping surfaces.

4. *Hammer-blow hand-wheel.* Reduces operator-fatigue to a minimum, precludes slippage of the workpiece and facilitates its removal.

5. *Hand-operated work-stop.* This assures maximum chucking efficiency and uniformity of thread length. The work stop also eliminates one cause of die breakage in that it accurately positions the work axially in the vise to prevent the chasers from striking against work shoulders.

This special adaptation of a standard LANDMACO Machine illustrates the utility of Landis Threading Equipment in the growing expansion of military production. Landis Engineers have helped many manufacturers, just as this one, with their problems in thread production by recommending the proper equipment, and process for the job, and by devising special tooling for the job's unusual requirements. Perhaps your current thread production problem may be solved as successfully as this.

LANDIS MACHINE COMPANY • WAYNESBORO, PA.



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AS FIREARM SIGHTS  
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OF ALL KINDS

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Wade is well known for the widely-used Precision Profiler that has been paying its way for users for so many years. Now we have designed a greatly improved profiling machine, THE WADE NO. 45, which is **HEAVIER, MORE RUGGED, MORE COMPACT**, with a powerful V-belt drive. Eight different speeds are possible.

This new hand profiling machine can be bench

mounted, or will be furnished with a sturdy metal pedestal cabinet. Easy to operate, many precision operations can be performed on parts such as these listed here. It has new cutter holder collets, with improved grip; and a follower spindle, parallel with the main spindle, holds the follower spindle cutter for producing templates from samples. Low cost, fast production.

*write for descriptive folder and prices*

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59 River Street

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PRECISION TOOLS FOR  
AMERICAN INDUSTRY

February, 1953

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-9





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ON THE MEZZANINE  
...WHILE THE MEN BELOW**

# **rivet**

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This is a riveting line at the Irving Subway Grating Co., Long Island City, New York. Yet you cannot hear the riveting! Why? Because it's done with Hannifin "Hy-Power," the modern cold-squeeze riveting method.

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No. 87

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are exclusive with Lapointe.

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engineered by

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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



**New, easy-to-use**

# Allied Swivel Shoes

**hold parts rigid without  
marring the surface!**



## **Hundreds of uses for these new time-savers!**

Thousands of Allied Swivel Shoes are now in use on drill jigs, shop tools, screw turrets, mill fixtures... *wherever parts or tools must be held rigid without marking or gouging the surface!* Parts can be held tighter; machined more accurately; finished parts released from the jig faster. Standardizing on these low cost, *uniform* swivel shoes throughout the shop eliminates costly, on-the-job machining of special shoes... results in important savings!

### **Two types available!**

**Hexagon Swivel:** Hexagon nut with precision-fitted shoe. Available for any type or size screw.

**Swivel Set:** Socket-head screw with precision-fitted shoe for use where space is limited. Available in 5/16", 3/8", 1/2", 5/8" and 3/4" dia.; any length, any thread.

### **As easy to use as tightening a screw!**

The first hint of pressure against the part or tool stops the rotation of the shoe, permitting the screw or bolt to be securely tightened without moving or damaging the held part. All parts are carefully machined to insure concentricity of shoe and accurate pitch diameter of screw. Hardened for long life, they can be *used over and over!*

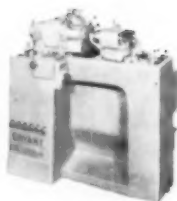
### **Economical, too!**

Their cost? Only a fraction of what they save the average shop in one hour's time! Ask your distributor for Allied Swivel Shoes. If he doesn't stock them yet, write to: Application Division, Allied Air Parts, 662 North Robertson Boulevard, Los Angeles, California.



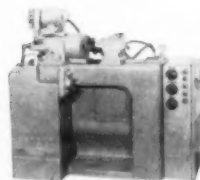
# Allied Swivel Shoes

## bryant internal grinding



### no. 1309-W

Finishes 2 bores and a taper straight and concentric. 2 wheelheads are used on this semi-automatic. Max. traverse stroke, 6". Max. grinding length, 3½".



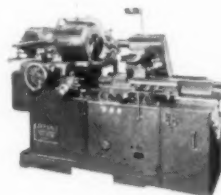
### no. 1109

For high production of small bores where accuracy of size and finish are required. Max. traverse stroke, 6". Max. grinding length, 3½".



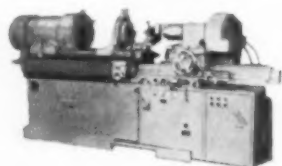
### no. 1316

Two wheelheads for high production of jobs requiring face and bore, or face and O.D. grinding. Max. traverse stroke, 20". Max. grinding length, 8".



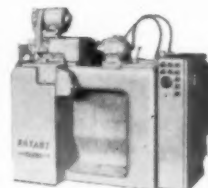
### no. 1116

A general purpose hole grinder for tool room, small shop, or general production. Maximum traverse stroke, 20". Maximum grinding length, 8".



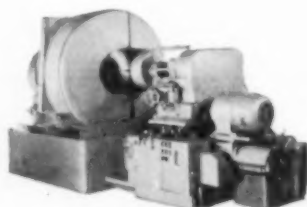
### no. 1416

Specially designed for grinding bores in long work, such as machine tool spindles. Maximum traverse stroke, 20". Maximum grinding length, 8".



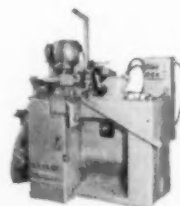
### no. 1209

A fully automatic, high production machine for small and medium bore grinding. Max. traverse stroke, 6". Max. grinding length, 3".



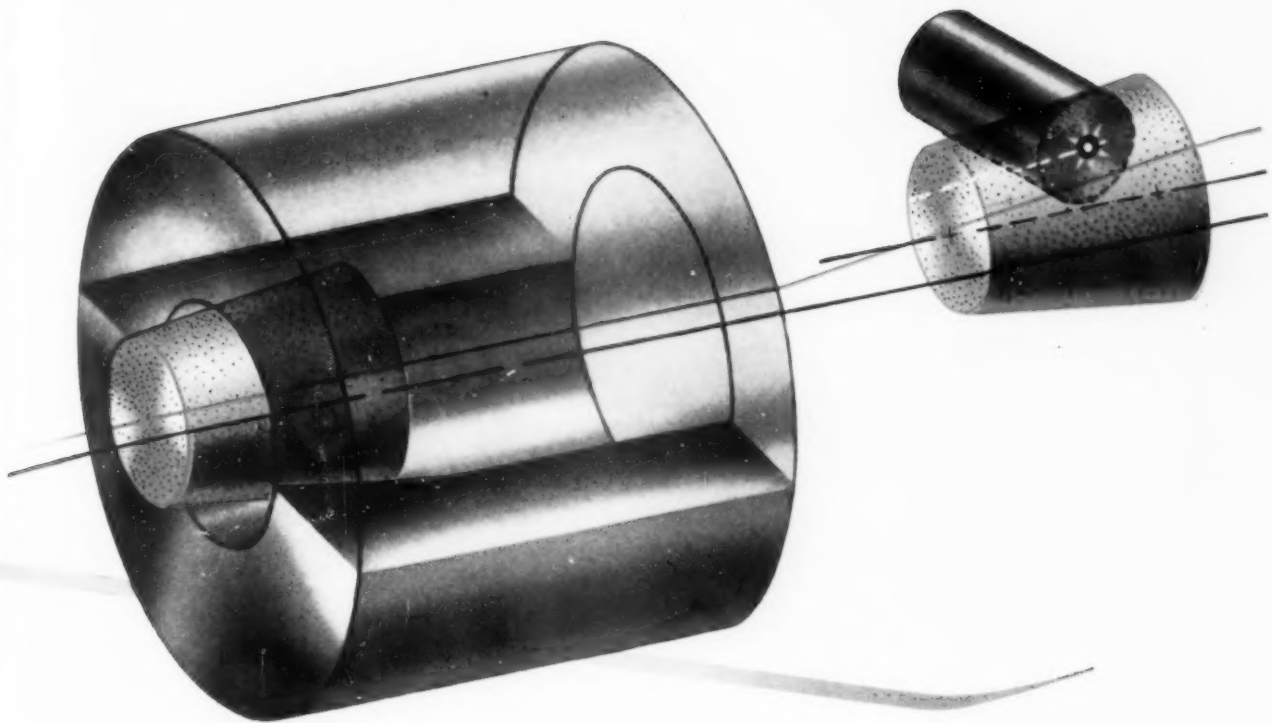
### no. 1460

For production or single piece hole grinding on parts up to 60" diameter. Max. traverse stroke, 21". Max. grinding length, 16".



### no. 2209

For precision and high production grinding of ball bearing races, gears, rolls, bushings, etc. Max. traverse stroke, 6". Max. grinding length, ¾".



**I**T is common assumption in internal grinding that once the grinding wheel passes the diamond, all errors will be eliminated and the wheel will be a perfect cylinder. It is also assumed that this grinding wheel can produce a straight hole. These two assumptions are true if the wheel path is a straight line parallel with the axis of the wheel as it passes the diamond and traverses the work.

In the illustration, the wheel slides are badly worn and the wheel path is not a straight line. The distortion in the ways causes the wheel to move gradually away from the diamond and the wheel is dressed to a taper as it passes the diamond. Then, as the tapered wheel traverses the work, it will grind only on its large diameter. At the point of reversal the tapered form will be transferred to the work. If the traverse stroke is lengthened, the tapered section will be moved to the new point of reversal. In addition, wheel wear will be excessive, finish will be poor, feed lines may be visible.

Available information advises simply turning the workhead or changing the length of traverse to correct taper. In the case illustrated, neither turning the workhead nor changing the length of traverse will produce a straight hole. The only possible remedy is to straighten the wheel slide ways which will, in turn, straighten the wheel path. The wheel will then contact the work properly, producing correct geometry of the hole, longer wheel life and better finish.

**Bryant Chucking Grinder Company**  
Springfield, Vermont, U. S. A.

*Internal grinders • Internal & External thread gages*





... you can count on it in every

# SIMONDS

*"Red End"*

## Power Hack Saw Blade

It's the *plus* you get in "Red End" Blades that makes the difference in overall performance, cutting life and dependability... a *plus* that starts with Simonds extra tough Hack Saw Steel, poured and rolled in Simonds own steel mill... followed by proven know-how in milling and setting the teeth and in heat-treating for uniform hardness and toughness of every blade. A choice of three types of job-designed blades in all standard sizes is another *plus* that pays off in extra cut-ability and lower hack saw costs for you. Get delivery from stock from your Industrial Supply Distributor.

THERE'S A RIGHT "RED END"  
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HIGH SPEED MOLYBDENUM  
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# Production Pointers

from

# GISHOLT



TIME-  
SAVING  
IDEAS



*Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.*

## SHOWS MODERN TREND IN BALANCING

### Machine Balances And Corrects 100 Fans Per Hour

Today, industry *knows* the importance of balancing rotating parts, large and small. It's fast becoming a regular part of production...and production balancing more and more is combining the complete balancing process in *one* machine.

*It's being done here:*

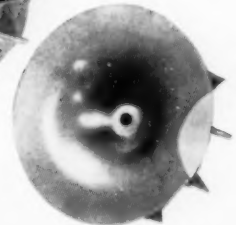
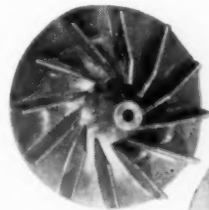
The part is a small fan for a well-known vacuum sweeper. One Gisholt DYNETRIC Balancer with correction equipment as an integral part of the machine, handles the full production—locating, measuring and correcting static unbalance at a rate of 100 fans per hour.

Locating and measuring unbalance is a matter of only a few seconds. The operator then turns the fan to the proper angle and turns a hand-wheel to correspond with the meter reading. At the press of a button, a fly-cutter removes the exact amount of metal to bring the fan into balance.

Thus, the *entire* job—locating and measuring unbalance, correction and

inspection for over-all accuracy—is done in one operation. It saves handling. Only one loading is necessary.

*With this entire balancing operation averaging only 30 seconds, the balancing cost is repaid many times by the greater smoothness, quietness and longer life of the fans.*



Front and back of fan with metal removed to correct unbalance.

#### HELPFUL INFORMATION

on balancing is given in the article, "Static and Dynamic Balancing" from the latest A.S.T.E. Handbook. Will be glad to mail you a reprint.



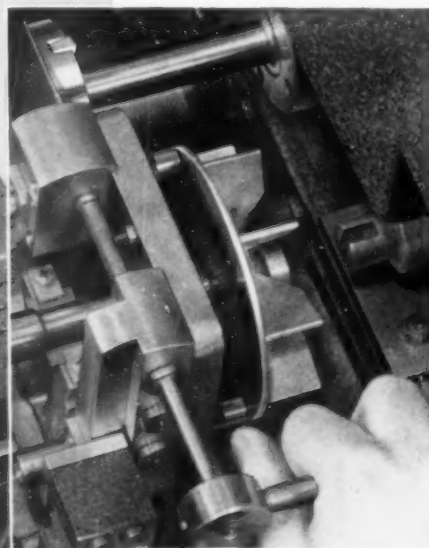
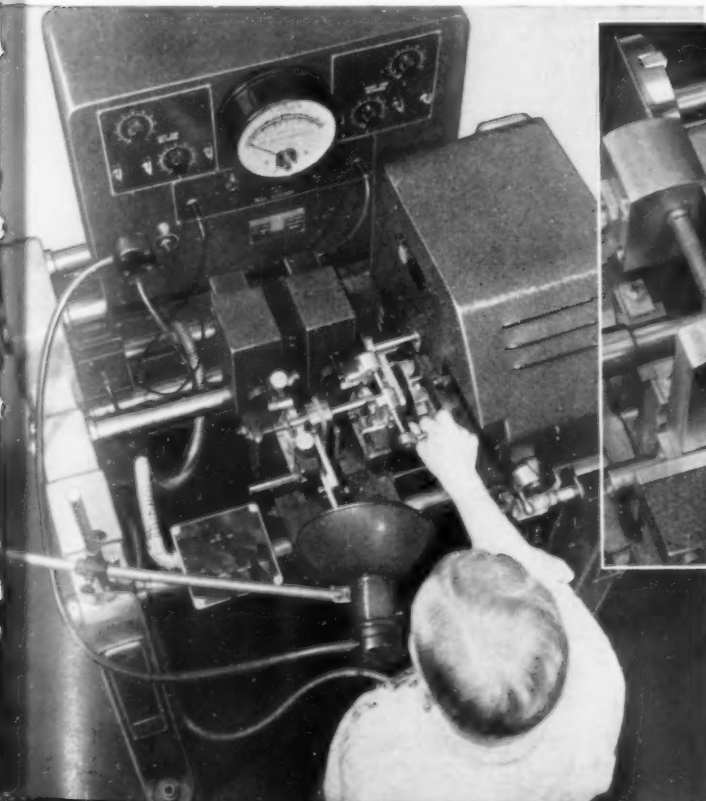
#### BALANCING SCHOOL.



Ask for details and starting dates of the Gisholt Balancing School, industry's only complete training program.

Close-up showing method of correcting unbalance by use of fly-cutter.

Gisholt Balancing Machine with integral correction equipment.





FOR MORE PRODUCTION FROM

## HOW CAREFUL PLANNING SAVES 2nd OPERATION

Two-Stage Setup on Simplimatic Provides Answers

TIME-  
SAVING  
IDEAS

*Here's ingenuity at work again.*

This Simplimatic Automatic Lathe is making real savings in the machining of these 4½" rock bits for oil well drilling. Here's the story:

**Loading**—Initial alignment is very important. This is assured by a special loading fixture. The bit, complete with cutters, is loaded into the swing-

ing air-operated cup fixture which holds it on the spindle centerline. An air-operated drawbar then pulls the loading fixture against locating stops. The chucking fixture is engaged and the piece is ready for machining.

**1st Stage**—An angular slide moves in to center the bore. With this done, it retracts and the tailstock center comes in to support the shank for the heavy cuts to follow. All this is part of the completely automatic cycle.

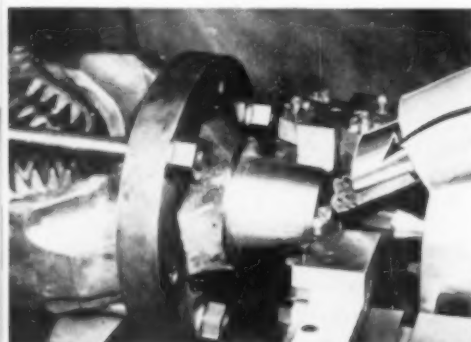
**2nd Stage**—With the center in place, tools on the front slide taper turn the shank, which is made up of three welded sections. Tools on the rear slide chamfer and turn the face.

Remember, all this is done in a single automatic operation... and the

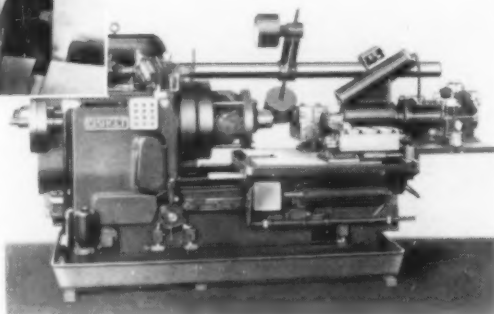
time is only 2.25 minutes. Production-wise, this Simplimatic (which handles a number of different size bits) is producing at a rate equal to three hand-operated turret lathes.

*The machining of these parts is reduced to a one-chucking job by the addition of a special tool slide for centering the workpiece.*

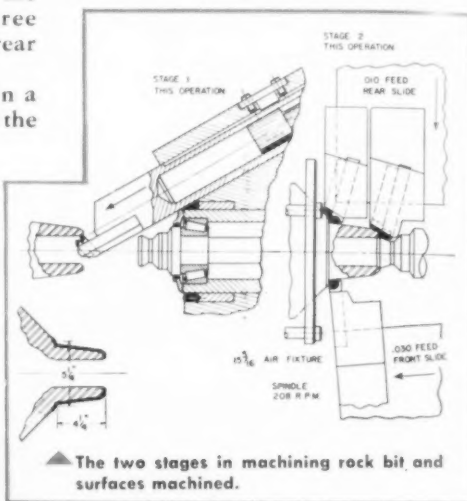
*This is just one of 31 interesting jobs shown in the all-new Simplimatic catalog. Write for your copy today.*



Close-up of tool slide extended to cut center in bit shank. Slide then retracts and tailstock comes in to support the shank.

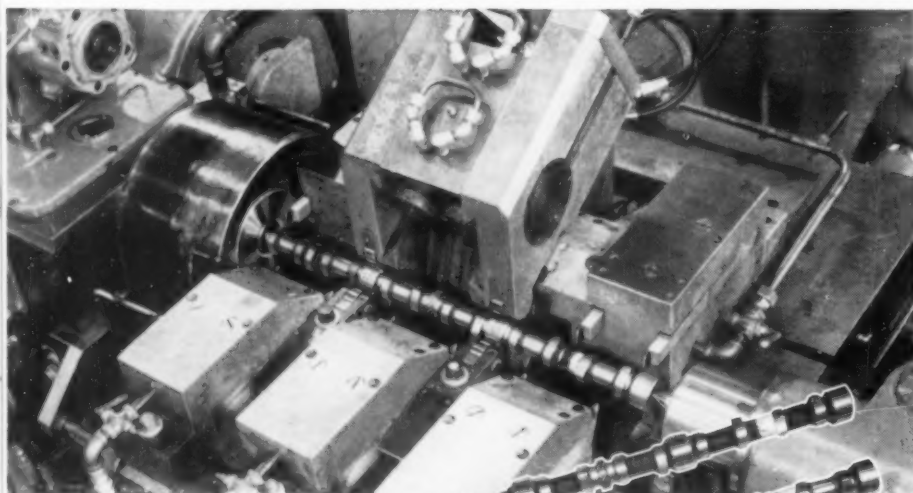


Simplimatic with special tailstock tool slide and swinging fixture for loading and unloading.



The two stages in machining rock bit and surfaces machined.

## CAMSHAFTS GET QUICK CLEANUP IN THIS HIGH-PRODUCTION SETUP



Tool setup for camshaft cleanup work. Note top and bottom supports.



Camshaft before cleanup; bottom camshaft after machining.

### Uses No. 12 Hydraulic Automatic Lathe

This job, cleanup operations on a six-cylinder camshaft, shows the kind of top speed, highly efficient setup demanded by the automotive industry.

A driver and center hold the forging. To give the long, thin camshafts the support required to prevent distortion and whip, there are two sets of intermediate rollers. The top rollers move in automatically before the cut is started and retract for unloading.

Slides and carriages are tied together in pairs to handle the entire length of the camshaft. The six diameters of the camshaft are turned by tools at the front. Form tools at the rear then plunge cut and clean up. Time per camshaft is 0.4 minute.

*The fully automatic cycle of the No. 12 Hydraulic Lathe simplifies and speeds cleanup work on these automotive camshafts.*



LOOK AHEAD... KEEP AHEAD... WITH GISHOLT



# MIN-HOURS AND MACHINES



## WHERE C/F TURRET LATHE REALLY PAYS OFF

### Inside Work Done with Ease

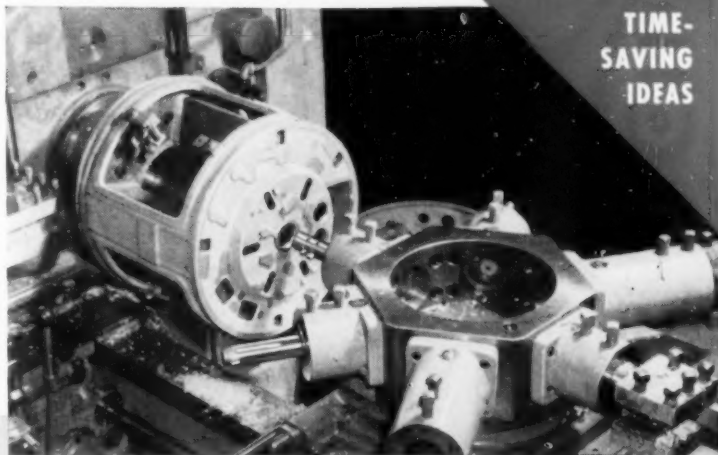
The two problems faced in the machining of these housings were (1) holding of the thin wall part and, (2) back facing the center bore. A special face plate fixture with draw-back clamps provided the careful chucking answer.

As for machining, the job might well have involved several operations with special tooling. However, the 2L Saddle Type Turret Lathe with its cross-feeding turret solved this problem. With the sliding hexagon turret, simple standard tools handle a number of different surfaces, including the back face and counterbore shown at the right in the drawing. Moreover, by doing the job in one chucking, concentricity is assured on the many different diameters.

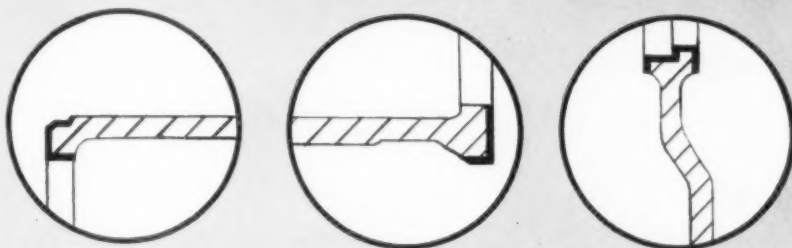
With the cross-feeding turret, you can feed both laterally and longitudinally. Thus you can use simple tooling and can quickly change over to other types of work.

*Simple tooling, plus the cross-feeding turret of this Saddle Type Lathe, add up to big savings on this interesting job.*

Simple setup for machining awkward, thin-wall part.



TIME-  
SAVING  
IDEAS



Operations, including back facing, performed on this job.

## GOOD TURRET LATHE SETUP FOR SMALL BRASS PARTS

### Ram Type Lathe Handles Parts in 5 Sizes

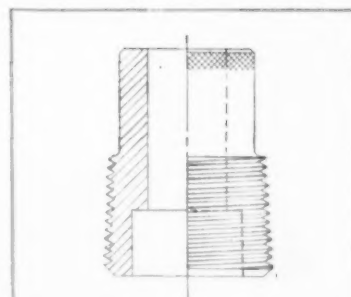
Here's a business-like setup for machining cast-brass plug bodies on a No. 3 Ram Type Turret Lathe. Held on the inside hex diameter by special jaws on an aluminum chuck, a combination turning, boring and facing tool on the first station does the bulk of the work.

Knurling follows at the next station with the required rough finish put on

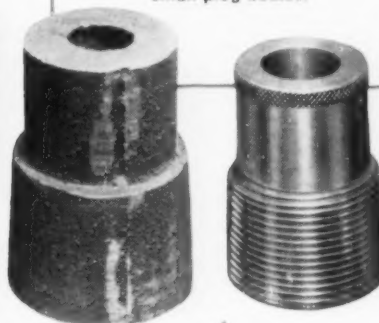
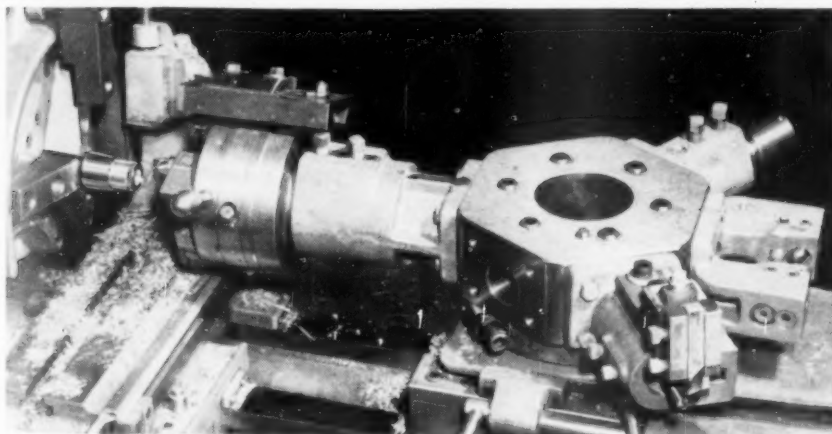
450 f.p.m. The third station is merely a revolving center which supports the end while a shave tool on the rear of the cross slide forms the taper O.D. At the last station, the taper is threaded by a special self-opening die head.

On a test run, this plug was machined in 0.84 minute, floor-to-floor. In addition, four other sizes, ranging from 1 3/4" to 2 3/16" O.D. are handled.

*This user is time ahead by a fine job of tooling and a fast ram type lathe.*



Work performed on the small plug bodies.



Before and after view of cast-brass plug body.

Final operation on the cast plug body is threading the taper.





TIME-  
SAVING  
IDEAS

## JOB SWITCHED TO FASTERMATIC— PRODUCTION DOUBLED



### Complicated Form Machined with Ease

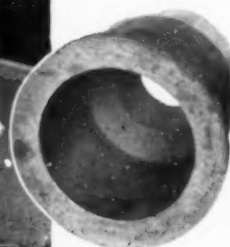
There was a 140% speedup in first-operation machining of these propeller nose nuts when the job went to the Fastermatic Automatic Turret Lathe. Time now is 5.0 minutes as against 12 minutes on a hand-operated machine.

The drawing shows the many surfaces to be handled. Working at five separate feeds, conventional tools rough and finish bore, turn and face. Doing the taper bore is a simple mat-

ter with the help of a turret facing attachment guided by a cam bar on the rear independent slide. A necking tool operated by an overhead stop bar does the recess in the bore.

Other advantages of the Fastermatic for this job are that no further finishing is required and its repeat accuracy has virtually eliminated spoilage.

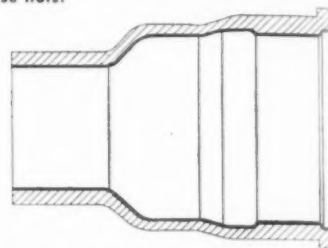
*Using standard tools, and in a continuous automatic cycle, this Fastermatic cuts tool costs and machining time in first operation work on these parts.*



▲ Before and after machining.



◀ Simple setup for first operation on propeller nose nuts.



Heavy lines show surfaces machined by Fastermatic.

**Good News on Deliveries!** Production has been stepped up again on 1F and 2F Fastermatics. Check your requirements with your Gisholt representative now.

## COST-SAVING IDEA FOR SUPERFINISHING

### Mounts on Lathe to Provide Better Surfaces at Lower Cost

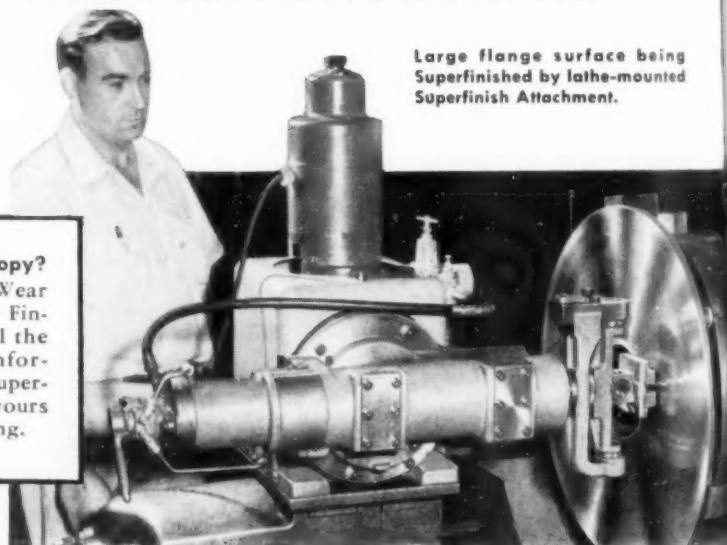
This beam flange for textile equipment is a far better product since Superfinishing has a part in its making. Yet, the investment in Superfinishing equipment is surprisingly low...the manufacturer simply mounted a Superfinish Attachment on the tool post of his engine lathe.

Formerly, the flange face was turned and then ground. Now, grinding has been eliminated and Superfinishing gives him a far better surface...in less time and at lower cost.

*With a lathe-mounted Superfinish Attachment, this user is gaining important savings in grinding time while getting better, smoother, longer wearing surfaces.*

#### Have your copy?

The book, "Wear and Surface Finish" has all the facts and information on Superfinish. It's yours for the asking.



Large flange surface being Superfinished by lathe-mounted Superfinish Attachment.

No. 1-253

604



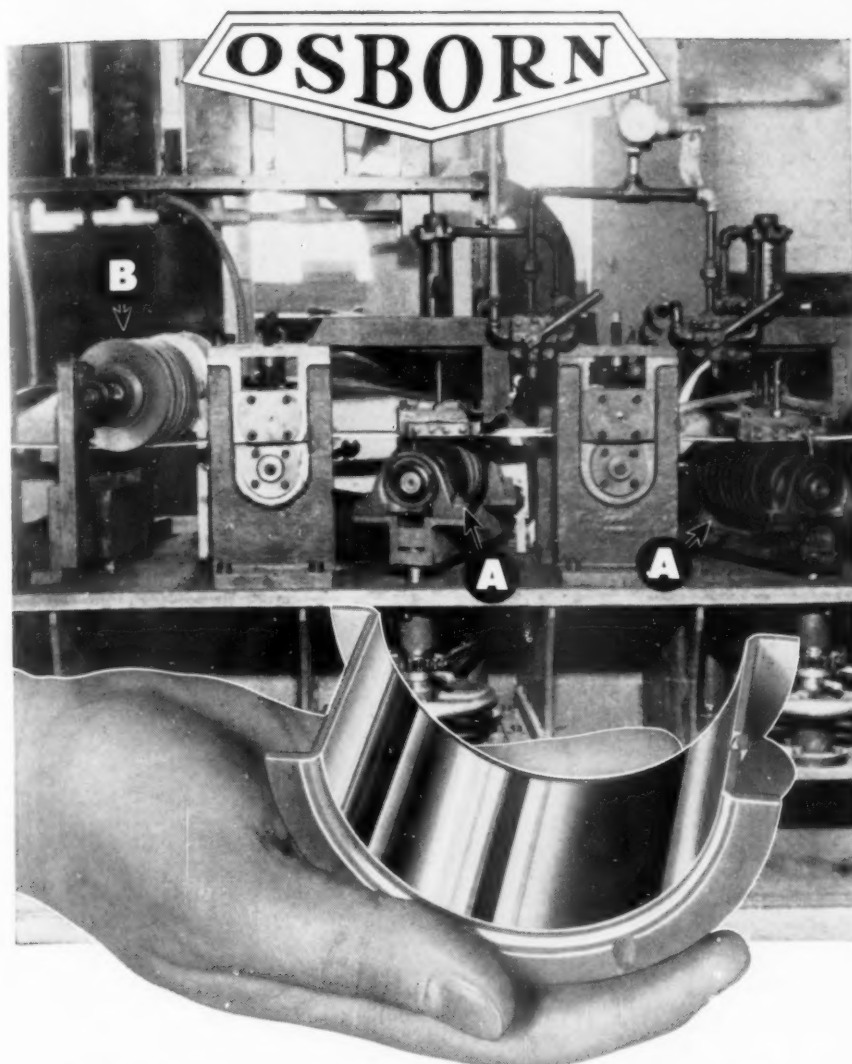
**THE GISHOLT ROUND TABLE** represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

# GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



## Will "automatic" ideas like these cut your costs?

**T**HIS machine does two jobs at one time . . . does them thoroughly by power brushing . . . at the push of a button.

Perhaps a similar brushing method can help cut *your* costs, boost *your* production and improve the quality of *your* products.

The machine developed with the help of the **Osborn Brushing Analyst** cleans steel-backed, babbitt-lined strip for production of automotive sleeve bearings. With the strip traveling continuously, Osborn Master Wheel Brushes (A) remove all dirt, rust and metal particles from the steel surface. Osborn Monarch Sections (B) then thoroughly clean the babbitt side.

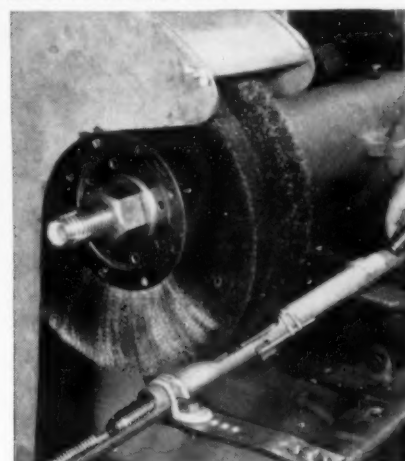
This is typical of the cooperation which your **Osborn Brushing Analyst** can give *you* to solve problems of product cleaning, burr removal, roughing, polishing and finishing. For help, call or write *The Osborn Manufacturing Company, Dept. K-1, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

# Osborn Brushes

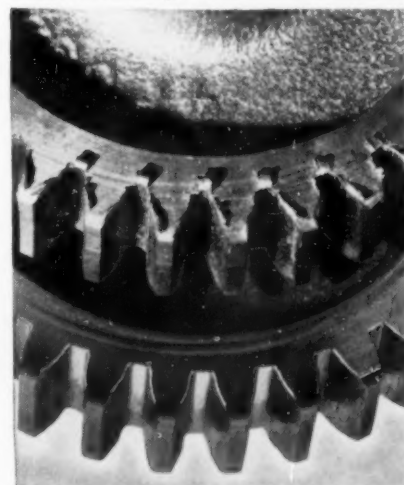
OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



**SAVES 12 MEN.** This is one station of a five-station rotary automatic machine equipped with Osborn power brushes that removes burrs and sharp corners of clutch disc teeth. Formerly done by hand. Saves 12 skilled men.



**9 TIMES AS FAST.** This simple pipe fixture provides the means of cleaning threads of set screws. Can be applied to many cylindrical parts. Time was cut from 18 seconds to 2 seconds with this Osborn brushing idea.



**10 TIMES AS FAST.** This shows two gears before and after deburring by a new Osborn power brushing method. Note smooth uniform results. Time was cut from 3 minutes to 18 seconds.



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... shoots trouble with it.

\*We can send you a free reprint of an article entitled "High Speed Photography in Design" which will help you orient yourself in this field.



## Have **YOU** considered **HIGH SPEED** movies?

High speed movies constitute a powerful weapon for engineers on tough design assignments or trouble-shooting expeditions. Quite a few types of extremely ingenious cameras for this purpose have been built, and they do remarkable things.\*

For all-around industrial use, the most practical of them is the Kodak High Speed Camera. At least, so it would appear from the experiences of leading American manufacturers in developing their outstanding products. The camera is simple to operate, produces very sharp pictures, and runs in the right speed range for most industrial applications (1000 to 3200 frames per second). It uses standard 16mm film, black-and-white or Kodachrome, and when you project it with a standard projector you see the action slowed down as much as 200 times.

If you need to see what's really happening in an operation too fast for the eye, write us about it. Our photographic engineers will advise you whether the Kodak High Speed Camera should be able to show it to you. Once you add this instrument to your engineering department, it goes on solving engineering problems from then on.

Full information and literature from Eastman Kodak Company, Industrial Photographic Division, Rochester 4, N. Y.

# the Kodak **HIGH SPEED** Camera

**Kodak**



A SINGLE-POINT CARBIDE TOOL is rough ground on a CRYSTOLON wheel. A typical job where these fast-cutting, cool-cutting silicon carbide wheels are proving their worth as cost-cutters.

## Add this cost-cutting "TOUCH OF GOLD" to your carbide grinding...

Save your diamond wheels with Norton CRYSTOLON\* wheels!

Conserving your diamond wheels during the present serious shortage of commercial diamonds is not only desirable, it is vital. Yes, and easy, too. Because:

On many carbide grinding jobs Norton CRYSTOLON (silicon carbide) wheels will give you results equally as good as diamond wheels — plus big savings. In fact, the skillful teaming of Norton CRYSTOLON wheels with Norton diamond wheels assures you the

true, value-adding "Touch of Gold" that means carbide tools at their very best.

### Where CRYSTOLON Wheels Save

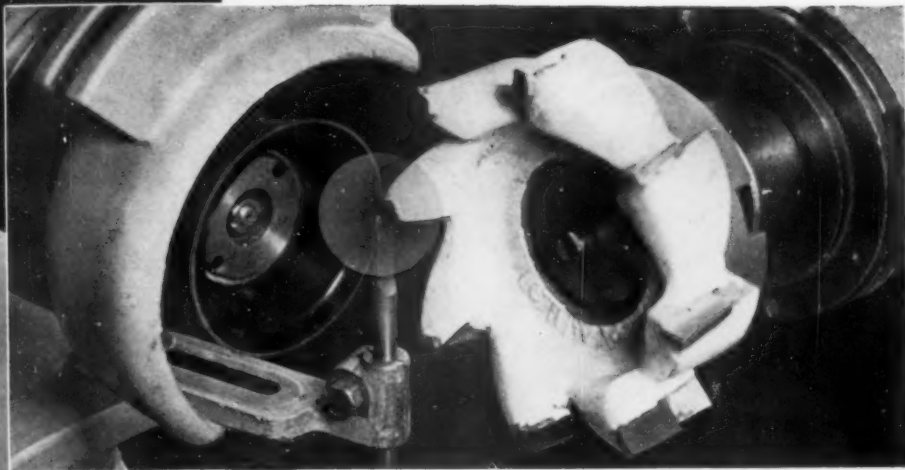
Recent tests in offhand grinding of single-point tools proved that the relatively slow wear of the diamond abrasive was more than offset by the much lower cost of the silicon carbide abrasive. Net result was that the silicon carbide wheels

cost about  $\frac{1}{8}$  as much to use as the diamond wheels. And a 60 grit silicon carbide wheel gave as fine a finish as a 100 grit diamond wheel!

### Many Other Savings

So it is with various other carbide grinding jobs, especially roughing, where you can replace costly diamond wheels with fast, free-cutting CRYSTOLON wheels. They are made in grit sizes up to





**CARBIDE TIPS ON A FACE MILL** get keen cutting edges on a Norton diamond wheel — the most efficient and economical wheel for multi-point tool grinding.



**NORTON WHEELS FOR THE "TOUCH OF GOLD"** in carbide grinding include diamond wheels in three bonds — vitrified, resinoid and metal — and CRYSTOLON wheels in two bonds — vitrified and resinoid.

200, resinoid bonded or in our new vitrified K-Bond — which is quality-controlled to produce half-grade increments of wheel hardness, enabling you to "pin-point" your exact specifications.

Of course, for grinding your multi-point carbide tools and similar jobs, you'll still want Norton diamond wheels in the correct bonds and grit sizes. But even here you may sometimes use CRYSTOLON wheels to advantage, especially on carbides used for machining cast iron.

#### See Your Norton Distributor

for practical aid in selecting the most economical Norton wheels — CRYSTOLON Abrasive or diamond abrasive — for your carbide grinding. That includes calling in your Norton Abrasive Engineer, if necessary, for advice on any tricky grinding problem. Backed by the world's largest manufacturers of abra-

sives, these Norton team-workers are ready to help you add the product-improving, money-saving "Touch of Gold" to every grinding job you do.

#### Get These Up-to-the-Minute Facts

Don't miss the December issue of *Grits and Grinds*, the Norton monthly magazine on grinding! It contains no less than three articles on carbide tool grinding by well-known Norton technicians. These expert analyses of the latest tested methods are packed with valuable

\*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

information on how to cut your grinding costs and improve quality. Write us for your copy, also for these two other booklets on carbide grinding and how to make diamond wheels last longer. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.



W-465



**ABRASIVES**

*Making better products to make other products better*

**Get a Load of  
these NEW**



## Here's a Brand-New Idea! . . . MORSE Taps and Dies Handsomely Boxed in Basic Sets and Conversion Sets

HERE'S ANOTHER MORSE ORIGINAL . . . these 7 well-chosen assortments of tools and sizes, protectively packaged in sturdy steel boxes with formed-wood inserts. You can buy these basic sets *now*, in either National Coarse Thread or National Fine Thread Series. Then later on, as you find need, you can buy the smaller conversion sets *in the other series* . . . and so complete your basic sets.

This is new convenience and economy in cutting-tool buying . . . a new idea from the

main source of *all* really new cutting tool ideas . . . MORSE.

So get your basic Tap and Die Sets *now*, and convert them later, as you need to. Get in touch today with your Morse-Franchised Distributor for full details and prices on this new Morse "package deal".

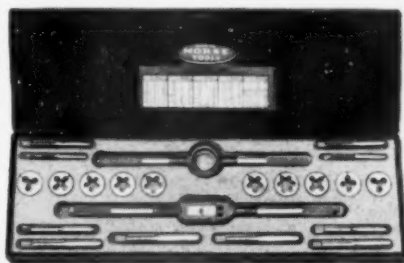
**MORSE TWIST DRILL & MACHINE COMPANY**  
NEW BEDFORD, MASS.

(Division of VAN NORMAN CO.)

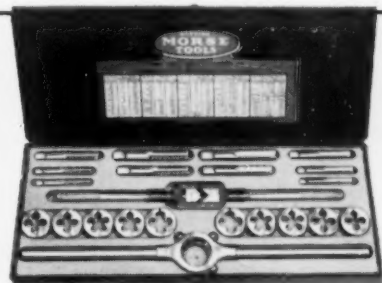
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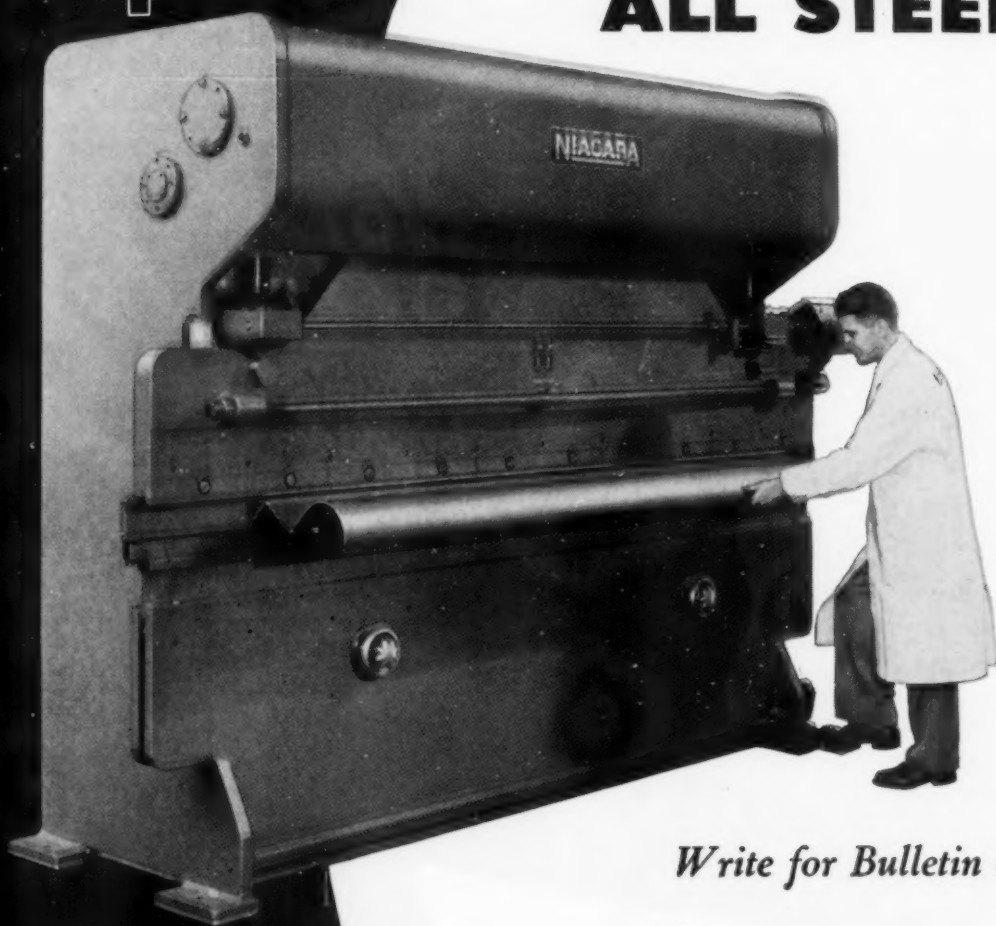
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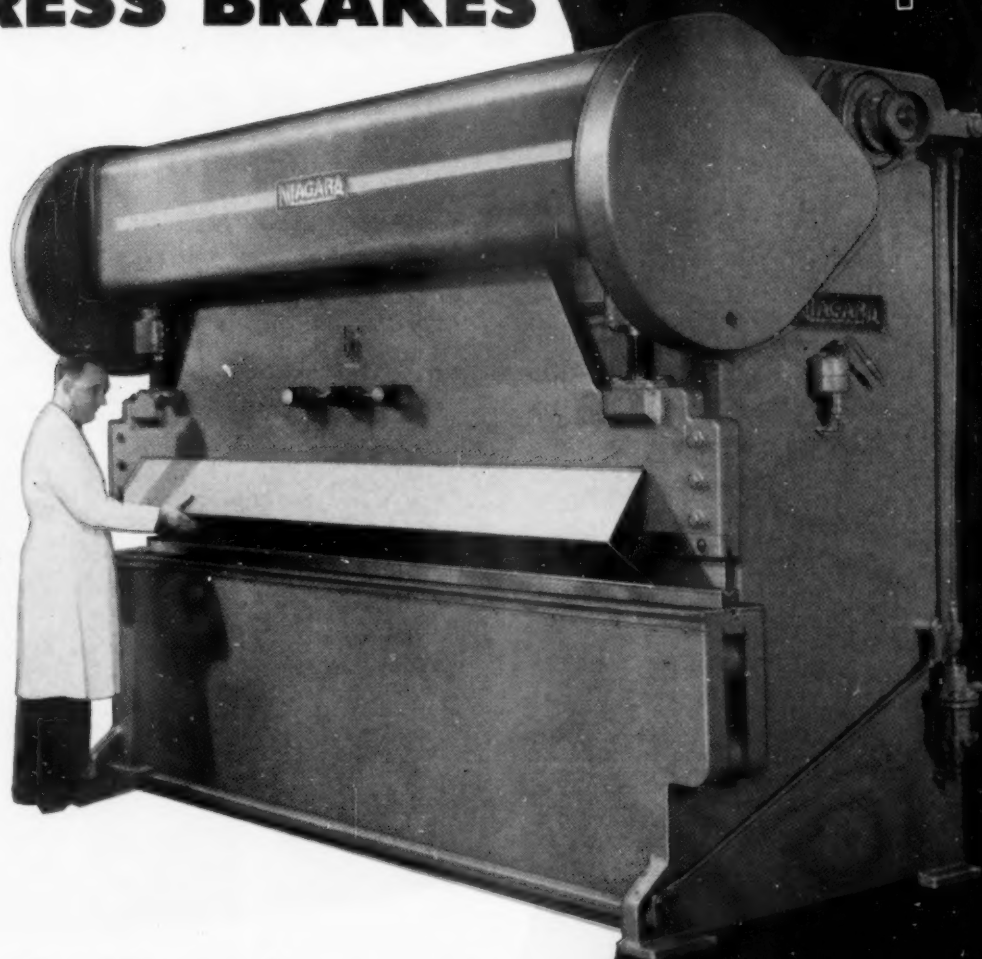
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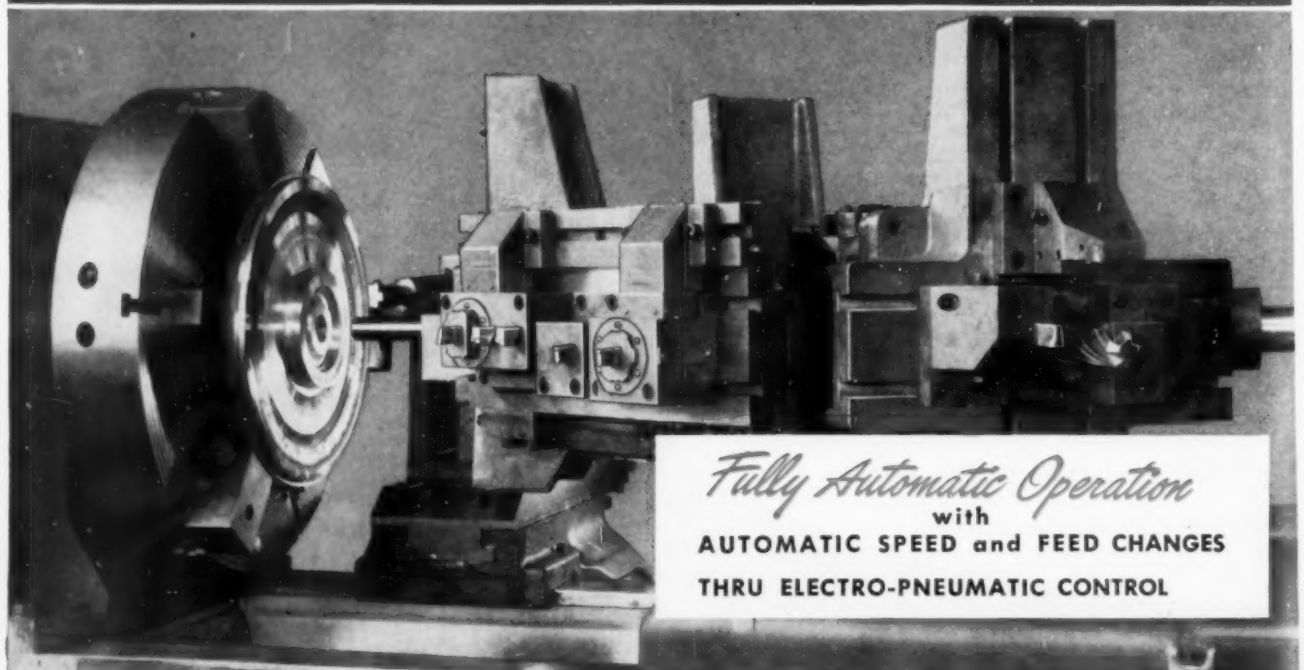
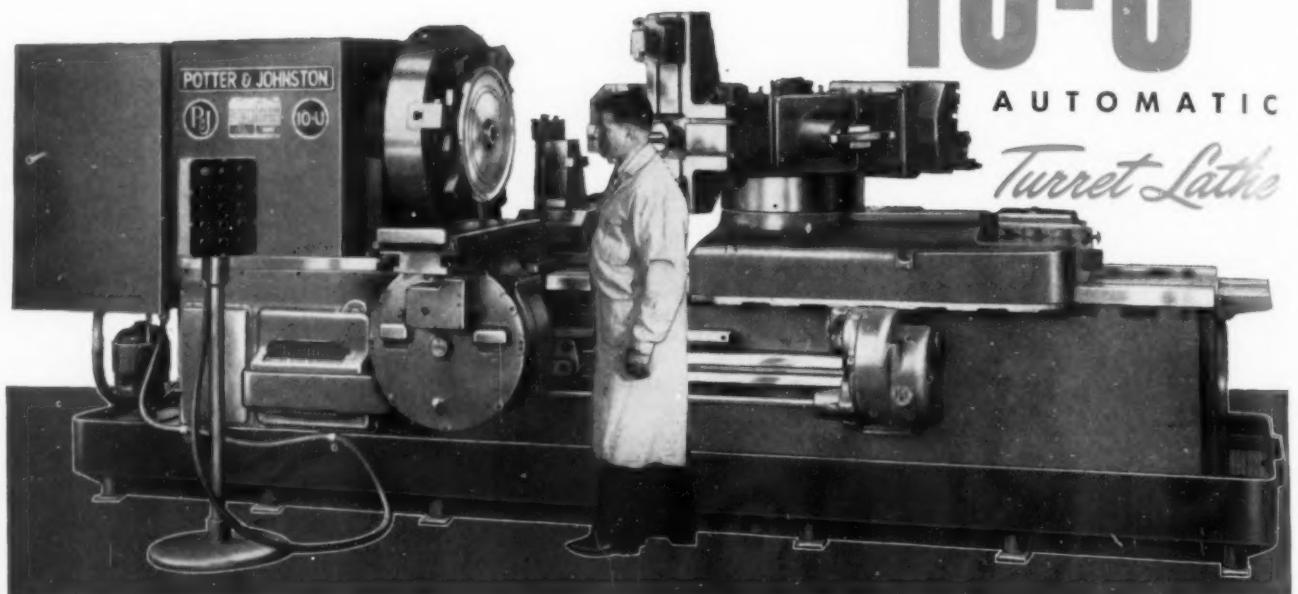
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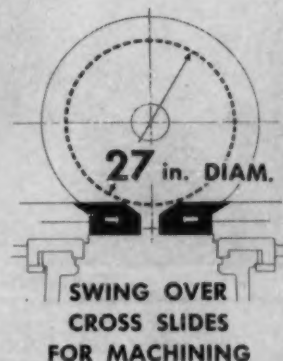
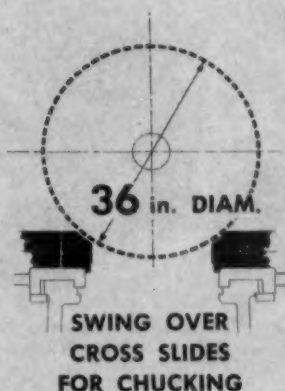
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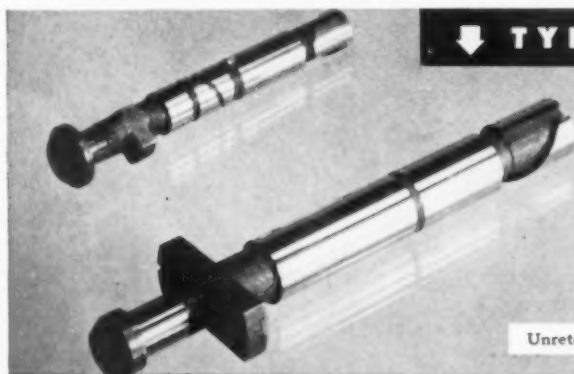


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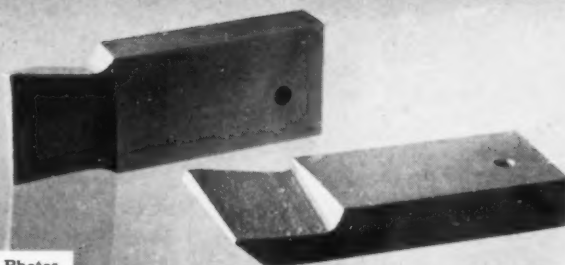
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Diameter of piston	0.276" 0.551"
Lapping allowance	0.00028" 0.00028"
No. of pieces per load	44 14
Lapping time per piece	0.45 min. 1.0 min.
Surface finish on both	RMS=0.5 micro inches
Out of Roundness	less than 0.00004"
Machine used	Type 2 U 5

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Surface finish	0.15 min.
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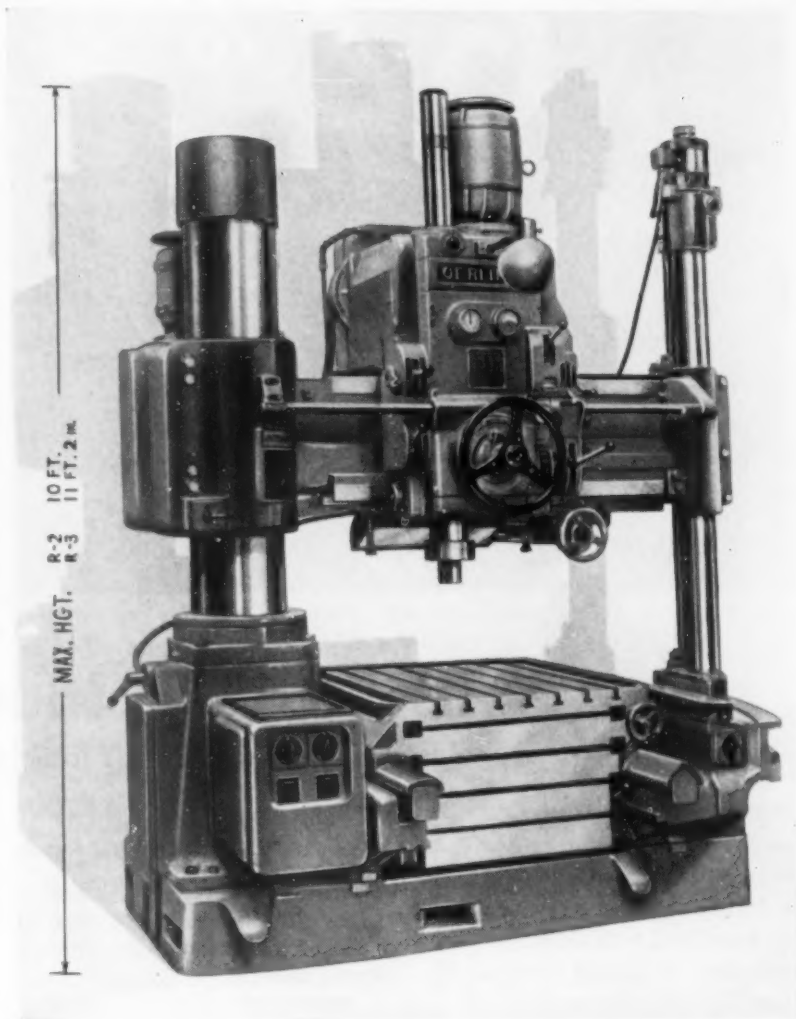
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at .018" per rev.  
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6 hp.  
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58-5/8"  
18  
38 to 1900  
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2-11/64"  
7.5 hp.  
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59-5/8"  
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47-1/4"  
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30 to 1500  
12  
.0012" to .0472"  
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anneal crank . . . . .	120.0	and clean . . . . .	92.5
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# The Tool Engineer

## ASTE Leadership Conference

Unity of purpose at both chapter and national levels is the goal of the Leadership Conference to be held in conjunction with the 21st Annual Meeting in Detroit. Because everyone concerned with the management and operation of the Society's chapters should use the same tools, the conference is planned to show how to use these tools and how to apply them effectively in all our activities. In this way, better understanding will be created with a more complete comprehension with respect to Society aims, purposes and functions.

Probably this is the first program of its kind conceived by any technical society to reach deeply into the membership. The two-day conference will be devoted to improving the coordination and liaison between chapter and national operations. As the functions of the national committees and headquarters staff are better understood, better insight into Society aims and purposes will result, promoting better understanding of responsibilities, developing better chapters and making better members.

Through this conference, originally conceived by Executive Secretary Harry Conrad, the Society will continue to maintain the leadership so essential in meeting present-day demands and the challenges of tomorrow. It is the inherent responsibility of the Society to serve its members, the profession, industry, the nation, and the world at large. This conference will be a major contribution toward achieving these goals. By keeping abreast of demands it will facilitate attaining the Society objectives. In this typical way, the Society will continue to be of service and to keep pace with an ever expanding and changing profession—tool engineering.

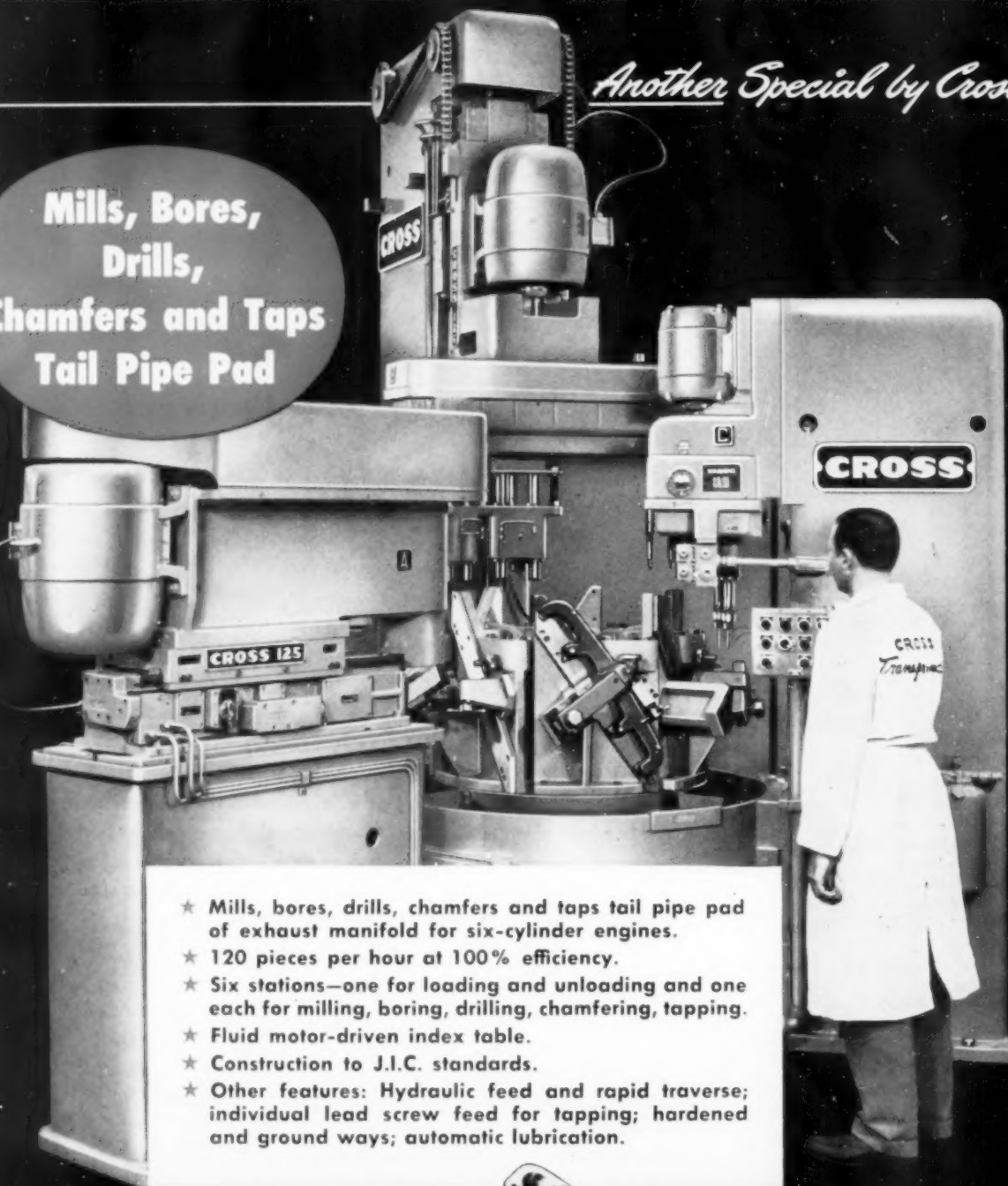
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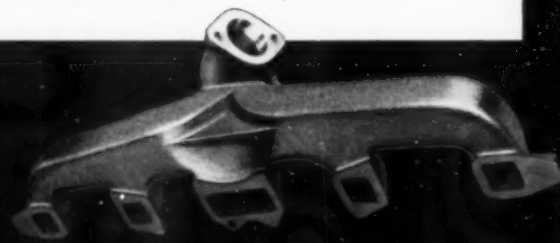


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Fig. 1. Many parts of this modern heavy-duty locomotive crane are guided flame cut.

## Gears Cut by Guided Flame

By R. E. Orton

Orton Crane & Shovel Co.  
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**G**UIDED FLAME CUTTING, while an old process for cutting steel, has had many new and valuable applications in recent years. Outstanding among these is the cutting of the tooth form and remaining contour of large diameter gears for use on full revolving locomotive cranes, *Fig. 1*. This application has resulted in a greatly improved product at a substantial reduction in cost.

Metal-cutting of parts such as the ring gear shown in *Fig. 2* has been made possible by supplanting the hand-guided torch with machine guiding wherein torches automatically trace out a faithful and accurate reproduction of a metal template. Perhaps just as essential as the guiding process is the traversing of the cut at a uniform and accurately preset rate of feed with precision control of the oxygen pressure and jet characteristics. These developments are, in a way, equivalent to those

which conventional machining methods went through many years ago.

Before the introduction of the flame-cut design, these ring gears were cast steel with the tooth form cast in as shown in *Fig. 3*. This internal gear has one hundred twenty-six teeth of  $2\frac{1}{4}$ -inch circular pitch (approximately  $1\frac{3}{8}$  DP), 90 inch diameter,  $4\frac{1}{2}$ -inch face. The teeth have a special contour and length with more than usual tooth clearances to allow for a small amount of lateral deflection of the revolving superstructure and inaccuracies and irregularities inherent in a steel casting, particularly one of this shape.

Because large cranes are manufactured in relatively small quantities, the cost per casting of the elaborate and expensively maintained pattern was large. Moreover, it was always necessary to do a considerable amount of hand grinding of the tooth

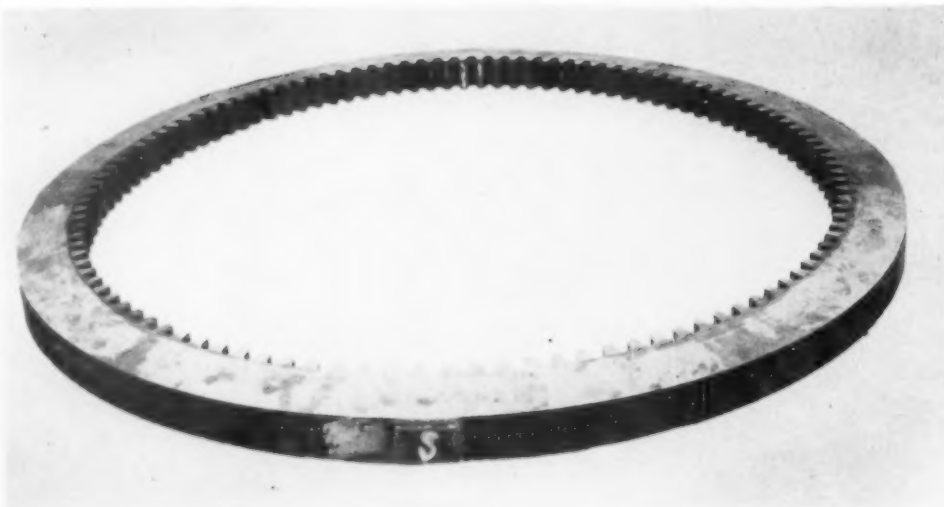


Fig. 2. Ring gear for locomotive crane is 90 inches in diameter. Tooth contours are cut to finish size by guided flame.

contour to obtain a satisfactory surface. Probably the most expensive requirement was the difficult straightening operation to bring the castings to a reasonable approximation of a true circle. Fig. 4 shows the fixture used for this straightening. The screw jacks were tightened at the indicated locations on the gear and torches were used to heat short sections at suitable places around the piece. At times several man-days were required to produce a satisfactorily curved part.

Another troublesome problem with the cast-tooth gear was the difficulty in controlling the pitch diameter. In spite of all efforts to obtain reproducible results, the diameter would vary due to variations in casting shrinkage. Since the drive was by means of a small (12-tooth) pinion mounted on a vertical shaft in the rotating superstructure, variation in pitch diameter, even though not large in proportion to the ring gear, produced sufficient variation in the distance from the center of the pinion shaft to the pitch line of the gear to result in mismating.

It was therefore necessary to measure the pitch

diameter after straightening and classify the gears according to size. Several cast tooth pinions, having slightly larger and smaller pitch diameters with corresponding variation in tooth pitch, were stocked to match the off-size ring gears. Installations were made in matched pairs. For this particular ring gear five different pinions were stocked, two larger and two smaller than the theoretical size.

Speed of rotation of these cranes is quite low, equivalent to a pitch-line speed of the gears of 25 to 50 feet per minute. Nevertheless, this inaccuracy, roughness of surface and irregularities of tooth spacing contributed to high shock loadings with wear and failures at a more rapid rate than could be desired for a part so involved in replacement.

This cast design has been replaced with the flame cut gear shown in Fig. 2. The flame machining is so accurate that the contour is indistinguishable, except by close inspection, from conventional machine-cut teeth, as may be seen in the close-up in Fig. 5. This change has not only meant a marked

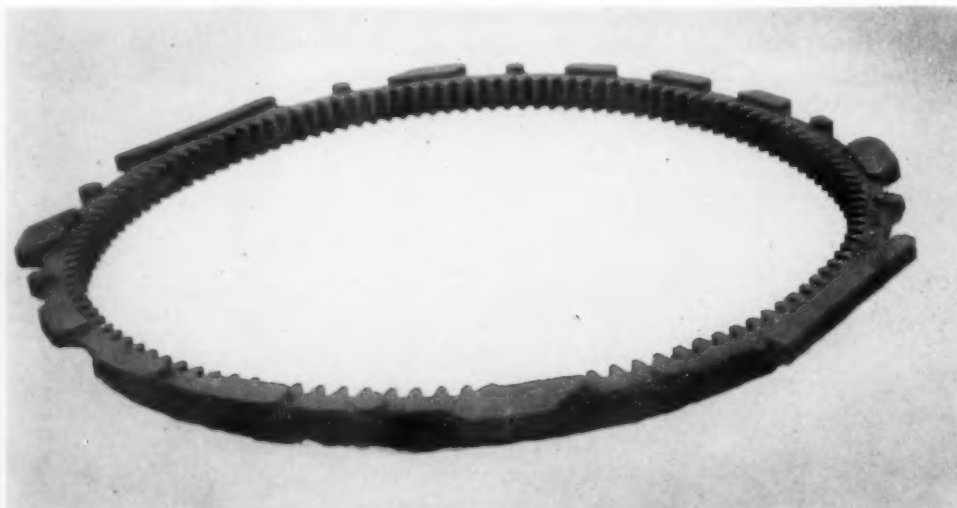


Fig. 3. Casting gear replaced by design for flame cutting.

reduction in the overall cost but has eliminated a troublesome maintenance item.

The improved surface and more accurate shape have made it possible to fit the pinion more closely to the gear, and the accurate control of the pitch diameter has eliminated the need for the special pitch pinions. Only one pinion size is used and this pinion is machine cut. It has also been possible to employ conventional cut-tooth contour, making what departures are needed on the flame-cut piece only. Special tooling for the pinion is not required.

More accurate and smoother surfaces and better matching of pinion and gear have reduced shock loading to the point that tooth failure and wear replacement are almost unknown. Because of this service experience, the ring gear is now welded to the substructure to form a solid and rigid unit.

### Flame Cutting Process

Before describing in detail the methods used to accomplish these results, the practice of flame cutting will be discussed briefly. Essentially it consists of setting up favorable conditions for the highly localized combustion of steel. A very fine jet of pure oxygen is blown onto the steel at high velocity. Since combustion of the steel by the oxygen does not develop sufficient heat to continue combustion, it is necessary to add heat to the steel as the cut progresses. This added heat is furnished by preheating flames, consisting usually of a number of oxyacetylene flames surrounding the cutting oxygen jet. This is accomplished by a compound

nozzle and control embodied in the torch.

These preheating flames, however, cause one of the important difficulties in the process and, particularly where carelessly used, are a frequent source of unsatisfactory cuts. In fact, probably no phase of the operation where quality cuts are to be obtained is of more importance than the proper adjustment and setting of the preheat flame. Also, in starting a cut, the preheat flame brings the steel to a cutting temperature before bringing in the cutting oxygen jet. This means that shape cutting must be initiated at a point separate from the desired shape itself and the moving cut then brought into the shape.

**Torch Guiding:** Flame cutting as a production method resulted from the development of mechanical means of traversing the torch at a uniform rate of speed. This was necessary to eliminate loss of cut due to the oxygen jet momentarily moving too fast for the preheat, or melting of the steel with notching effect due to the cut moving too slowly. It was also found that the quality of cut is improved if the height of the nozzle above the plate is accurately maintained. This led to the development of simple mechanically guided torch equipment consisting of a small carriage with an arrangement for holding the torch, and with a variable-speed electric motor to traverse the carriage. For straight-line cuts the carriage was set on rails. For irregular shapes the carriage was guided by hand.

The success with this simple guiding method led to further refinements. Torch nozzles were im-

Fig. 4. This fixture was necessary to straighten the casting shown in Fig. 3.

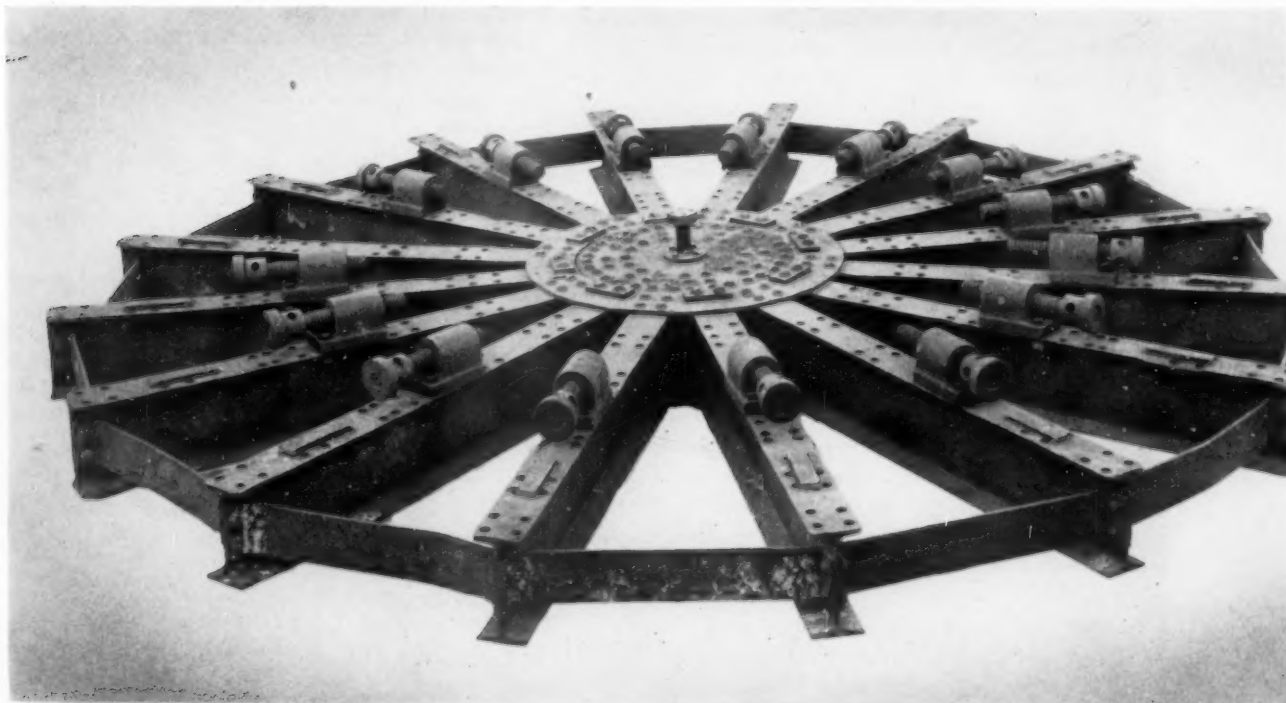






Fig. 5. As-cut segment of flame contour gear.

proved and highly accurate pressure regulating devices were developed to maintain a uniform pre-set pressure at the cutting nozzle and on the preheat flames. Eventually this led to the precision machine illustrated in Fig. 6. It consists of a rigid steel bar on which is mounted one or more cutting torches and a tracer head. The bar is so supported that it may be freely moved about, yet is guided in such a way that it moves accurately in a horizontal plane and remains precisely parallel to its original position so that its motion along a set path at the tracer head will develop exactly the same motion at every other point on the bar. Thus the cutting torches follow the identical pattern traced by the tracer head and the nozzle tips remain in a horizontal plane.

To accomplish this, the bar is carried on pantograph arms with joints formed by precision anti-friction bearings, giving a rigid and playless action to the bar. The anchor points of the arms are on a heavy carriage mounted on steel rails, precision-set in the floor. An electric motor with a variable-speed drive traverses the carriage along the rails.

Limit switches on the pantograph arms operate when the arms are either too close to or too far from the carriage to start the motor and traverse the carriage at a rate faster than the bar so as to bring it to a more favorable position. The arms, in turn, carry the cutting bar so freely that a very small lateral load at the tracer head is sufficient to move the entire bar through the desired pattern.

Each cutting torch may be adjusted vertically by a rack and pinion to bring its preheat flames to the most favorable position. Accurate pressure regulators, located convenient to the operator,

control the pressure of the acetylene and oxygen for both the preheat flames and the cutting oxygen, furnishing the same value at each torch. Individual throttling needle valves are also provided at each torch. A city gas pilot light automatically lights each torch. All torches are cut in, in proper sequence, by the centralized valve controlled by the rod and handwheel seen just above the rear end of the bar, Fig. 6.

**Template Tracers:** Three types of tracing heads—manual, spindle and magnetic—are commonly used, each being equipped with a small variable-speed driving motor so that the rate of traverse of the head and torches may be set to any required value. The manual tracing device consists of a small wheel that is brought to bear on a template laid on the template table. This wheel is rotated by the drive motor and the head is hand guided to follow a full-size template or drawing.

The spindle tracing device has a small-diameter knurled spindle rotated by the drive motor. When held against the edge of a template (usually plywood or similar material), it will reproduce the shape indicated by the template.

#### Gear Fabrication

The head used to produce the high quality cuts for the ring gear teeth is the magnetic tracing device. Essentially this device is the same as the spindle arrangement except that the spindle is fitted with a knurled steel roller and is one pole of an electromagnet. The template is made of magnetic material such as  $\frac{1}{4}$  to  $\frac{3}{8}$ -inch thick mild steel

plate. Magnetism holds the spindle roller against the template and rotation of the spindle traverses the cutting torches.

This arrangement makes the cutting fully automatic, once the cut has been started and the template engaged. This magnetic head is shown in *Fig. 7* following the template for the ring gear. The head may be raised and lowered to position it to the template by means of a rack and pinion. A tachometer mounted on the head shows the lineal speed of cutting and an indexing dial presets the speed. The head may be traversed a small distance along the bar by means of a handwheel so that the cut may be started away from the desired shape and then "walked in" to the shape cutting position.

The ring gear shown in *Fig. 2* is made in quarter sections to reduce scrap loss and for other manufacturing reasons. It is then welded into a circle with sufficient weld to hold it in shape and alignment while being fully welded to the crane's substructure.

**Work Tables:** Work-holding tables offer something of a problem. Each shop usually develops its own individual arrangement to best suit its needs. The table must present a minimum of contact with the work to reduce local heat conduction and to produce the minimum of interference with the action of the cutting oxygen jet. Also, the table must support the plate and cut pieces adequately and must also have cheaply made and easily replaced consumable work supports.

The arrangement developed at this company's plant for plates up to eight inches in thickness is seen in *Fig. 6*. Steel flats,  $4\frac{1}{2} \times 2\frac{1}{2}$  inches, are laid in parallel rows at intervals of about 16 inches on widely spaced steel beams. Four-inch squares of 1-inch thick material are welded at regular intervals along each flat. These squares have 1-inch diameter "drive fit" holes on their centers and the flats have  $\frac{3}{4}$ -inch diameter holes through them in line with the 1-inch holes. "Pegs" consisting of 1-inch diameter rounds cut accurately to a 5-inch length by a bar cutter are driven into the 1-inch holes until their ends abut on the flat. They furnish the replaceable supporting means. The  $\frac{3}{4}$ -inch hole through the support flat serves for a knockout.

**Template Shape:** Because of the diameter of the traversing roller, the magnetic template is not a duplicate of the shape to be cut. This also sets some limitation on the shapes that may be made, in particular the sharpness of corners around which the tracing roller must travel. A  $\frac{1}{2}$ -inch diameter roller is commonly used for work for which a  $\frac{1}{4}$ -inch corner radius is the minimum desirable, although a  $\frac{3}{16}$ -inch radius, because of the kerf, may be obtained. With internal template corners, a  $\frac{1}{16}$ -inch radius may be obtained. Templates are laid out to scratch lines and band-sawed close to line, then machine filed to the scratch line, using a three-diameter toolmaker's glass mounted on the filing machine so that the required accuracy is obtained.

The gear shown in *Fig. 2* serves also as a roller

*Fig. 6.* Cutting internal gear segment. Magnetically traced template is at the rear.



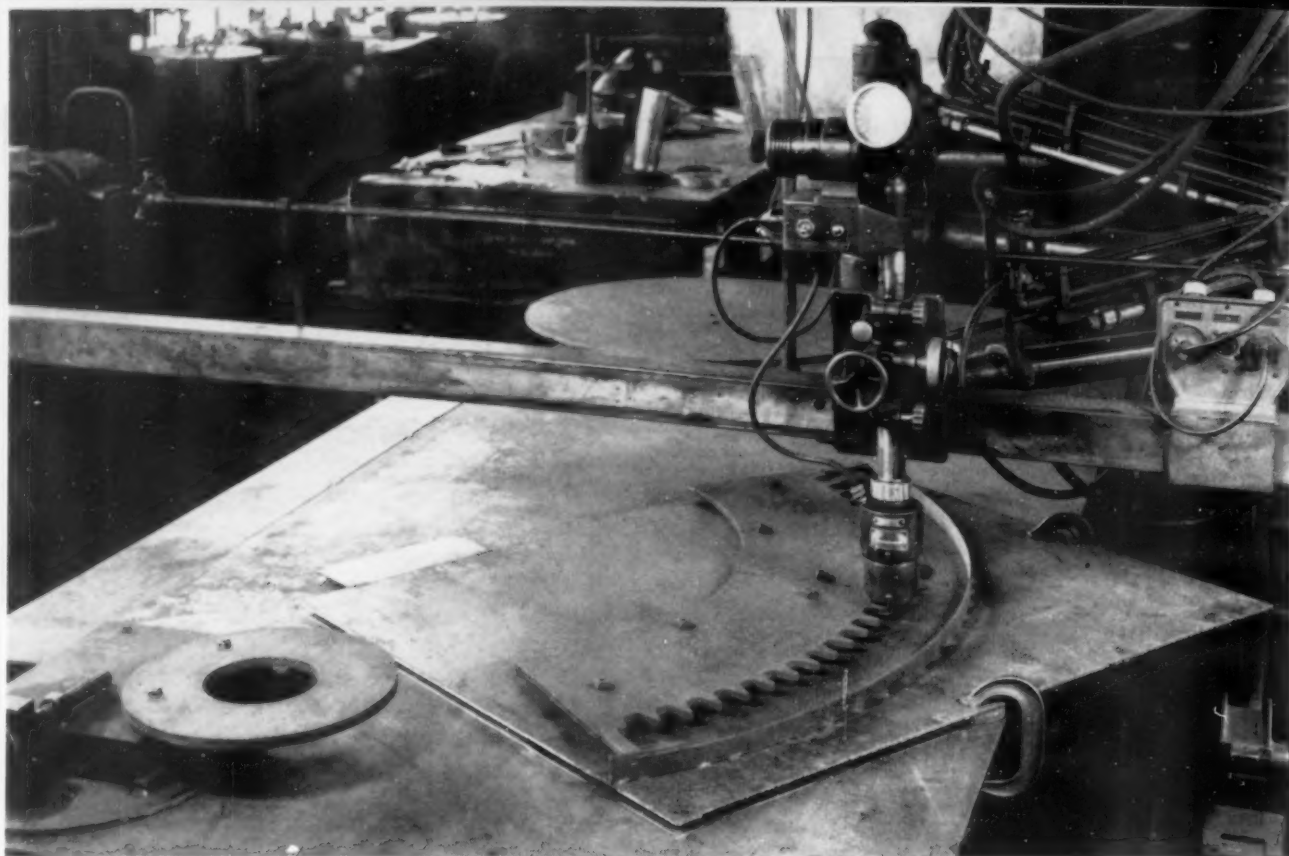


Fig. 7. Magnetic tracing head following gear template.

path for the rollers on which the upper works of the crane revolve. A section through the member is shown in Fig. 8. It is cut from 5-inch hot-rolled open-hearth, killed steel, 0.45 percent carbon. A No. 60 cutting tip is used with acetylene pressure of 4 psi, preheat oxygen 20 psi, cutting oxygen 115 psi, kerf width  $\frac{1}{8}$  inch, speed of cut  $5\frac{1}{2}$  inches per minute. Accuracy of tooth contour is estimated at plus or minus 0.006-inch ruling, with much of the cut appreciably better than this.

**Preheat Damage:** It was mentioned before that the preheat flame does a certain amount of damage to the plate. With accurate quality cuts such as in the case of this gear, it is necessary to move the cutting torch at a speed somewhat slower than would ordinarily be used in order that the bottom of the cut does not lag the top.

This increases the demand for preheat so that melting of the surface is somewhat aggravated. The close-up in Fig. 5 shows the teeth as cut. The piece has been turned upside down but the damage due to the preheat flame may be seen around the edges of the teeth at the bottom. However, most of the material to be seen around the edges is oxide slag, rather than damaged metal. As a first machining operation, the bottom of the gear is surfaced and the relief shown in Fig. 8 is machined. This removes the metal damaged by the preheat flame. The gear is then inverted and the roller path machined.

A quality cut may not be made too close to the edge of the plate. Otherwise, regions of the cut will

be much hotter than others and when the metal shrinks back on cooling, the shape which was accurate when hot will be distorted. In the case of this gear, about  $\frac{1}{2}$  inch must be left.

**Accuracy of Cut:** While material up to about 0.30 percent carbon may be cut when chilled, this may result in checking along the line of the cut with the 0.45 percent carbon of this gear. Such plates must be warmed to shop temperature before cutting. The chilling of the cut edge by the interior of the plate also hardens it, when carbon content is this high, so that annealing is necessary before machining. This is usually done at 1000 to 1200 F.

These gear sections are also heat-treated after machining by an oil quench. The greater cooling surface on the inside (tooth side) results in a small "opening up" of the curvature of the shape. This is readily corrected by straightening on a bulldozer with the piece warmed to about 150 F. Short pieces of scrap cutting of the teeth are fitted into the gear teeth as a bearing point for the bulldozer ram.

Accuracy of the cut on plates up to 4 inches thick is generally held to plus or minus 0.005 inch with a "drop off" about 0.005 inch about  $\frac{3}{8}$  inch from each surface. Plates, 8 inches thick, are held to about 0.010 with a drop off of 0.015 for  $\frac{1}{2}$  to  $\frac{5}{8}$  inch from each surface. Incidentally, this drop off of the cut is a desirable feature on these gears, since load bearing is relieved at the critical ends of the teeth.

Other interesting examples of flame cutting are shown in Fig. 9. In the upper left is a split axle-



gear made from  $4\frac{1}{2}$ -inch, 0.45 percent carbon plate. It has 36 teeth,  $2\frac{1}{2}$ -inch circular pitch (approximately  $1\frac{1}{4}$  DP), 29-inch pitch diameter. It was cut at a speed of 8 inches per minute using a No. 60 tip with 130 psi oxygen cutting pressure. This piece is cut as a full gear and then divided. The hub-reinforcing pieces shown below it are welded on. The slots are for the junction bolts. This split gear is mounted on the axle of the crane for the final drive and replaces a molded tooth gear formerly used. Owing to the play of the axle in its journal and on the car springs, it is necessary to use a specially developed shape for these teeth. The teeth have larger clearances than usual and are longer so as to secure suitable engagement with the pinion under all conditions. The flame-cutting method makes possible any shape desired at no extra cost over a standard shape.

The mating pinion is shown at the right with its reinforcing hubs below. The pinion has 24 teeth, 19-inch pitch diameter, and is 6 inches thick. It was cut with a No. 80 tip using 115 psi oxygen pressure and cutting speed of  $5\frac{1}{4}$  inches per minute. It is cut from an AISI E4140 analysis blank. To cut this steel it is necessary to preheat the entire blank to about 400 F and maintain this temperature while cutting to prevent cracking and checking. It is annealed at 1200 F immediately after cutting.

The plate at the bottom of Fig. 9 is the web of the main machinery side frame. The thicker pieces above it form the bearing boxes. They are cut from heavy plate and welded to the web plate along with flange bars to form the complete unit. These parts are fitted together and welded into a unit without further preparatory work and are stress relieved and machined after welding.

### Production Costs

Cost comparisons of flame-cut parts present a problem in that it is difficult to determine gas consumption. In fact, in the interest of simplicity of accounting, the gas cost is usually considered a general burden. However, from data furnished by makers and tests made by Orton Crane & Shovel Co., the curves shown in Fig. 10 have been developed. Speed of travel of the torch, in lineal inches per minute, is plotted against thickness of plate. The speed shown is somewhat lower than that in most catalog data. These lower speeds, however, are necessary to secure high quality cuts. With higher speeds, although more efficient, the cut at the bottom of the plate would lag behind the top and, in making intricate shapes such as these gears, this lag obviously could not be permitted. The speeds shown in Fig. 10 will give no perceptible lag.

If the oxygen and acetylene consumption, and the speed, are plotted in terms of square inches of cut, more satisfactory data will be obtained. Fig. 10

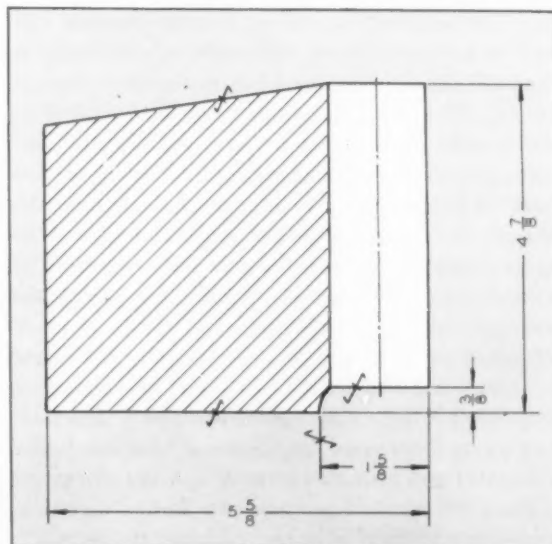
shows speed of cut in square inches per minute plotted against plate thickness and it will be noticed that thicker plates are actually cut at higher rates. The oxygen consumption per square inch also increases with the thicker plate so that the additional speed is gained at an increased cost in gas per unit of cut.

Reliable data on acetylene for the preheat flame are also difficult to obtain. Much depends upon the individual operator, as well as such intangibles as the area of plate from which the cut is being made. In the diagram this consumption is shown at a uniform 0.017 cu ft per square inch for thicknesses from 12 to 2 inches and then is shown as increasing for the thinner cuts. This data involves the smallest item of cost and the information is probably sufficiently accurate for cost analysis.

Cost allowance should be made for the walk-in to the template, disposal of scrap by cutting it up to break it free from the main plate, and other incidentals that add to labor time and gas consumption. To these costs it is, of course, necessary to add setup time. With the exception of preparation of templates, setup is not generally time consuming. In the case of these rotate gears, a template may be set up, material brought into place on the table and the torch brought into operation in a matter of 15 minutes. The machine may be cleared of equipment in an additional 20 minutes so that the total allowance for setup, exclusive of making of the template, is about 35 minutes. This low setup time makes possible economical manufacture in low quantities.

For large quantities multiple torch construction may be used where identical shapes are being cut from one template. Incidentally, on circular cuts, more nearly perfect circles may be obtained if the cut is stopped halfway around, torch returned to

Fig. 8. Section of rotating gear and roller path.



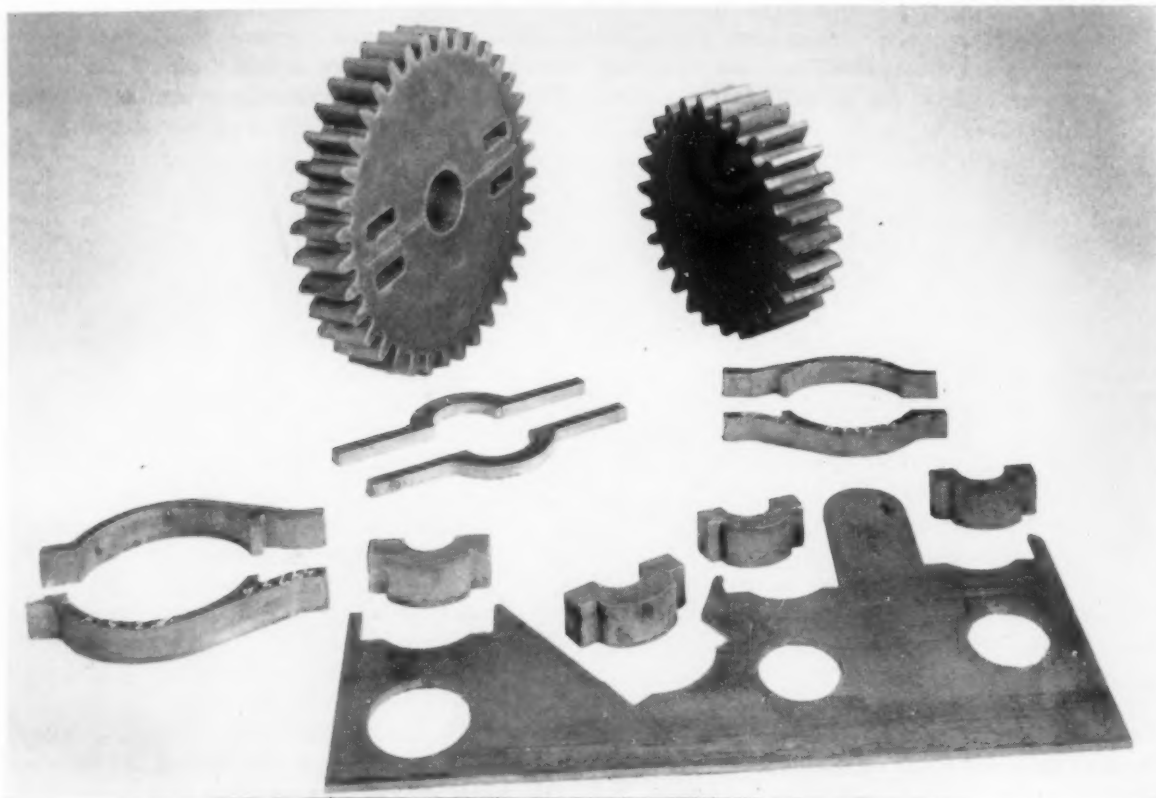


Fig. 9. Several flame cut locomotive crane parts. Top, split axle gear and driving pinion. Bottom, machinery side frame.

the starting point and the cut continued in the other direction. This reduces the heat distortion.

Stacking is another method of increasing production of thin pieces. In using this method it is necessary that the plates be flat. Usual commercial quality as obtained from the warehouse is satisfactory.

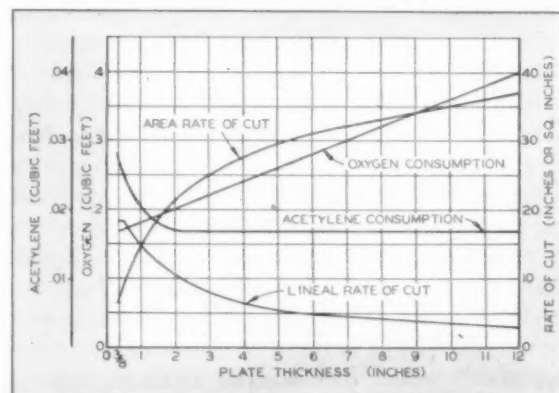
Heavy mill scale or rust is another difficulty which is experienced due to quality of the steel, in particular in the case of heavy sections such as used for this rotating gear. If a heavily scaled surface is placed with the scale side up, the scale acts as a heat insulator and it will be found extremely difficult to secure adequate and uniform preheating so that difficulty is encountered in maintaining the cut. On the other hand, if the scaled surface is placed on the bottom, the cutting jet may be deflected with damage to the lower surface and possibly even flow back of the jet with notching of the cut. Heavily scaled surfaces simply cannot be permitted on quality cuts and the steel must either be descaled with a torch or, in the case of heavy rust that is not too tight, with a vibrator tool.

An interesting specialty for holding small-sized templates is shown in the lower left of Fig. 7 with the template for a ring fastened in place. The table piece may be moved by means of the handwheel and screw and furnishes a versatile arrangement for making the cut walk-in from any desired direction. The magnetic head is brought against the template,

the cut started, and template and the head with it moved the desired walk-in distance. Then the tracer motor is started and the shape cut. This is particularly valuable for multiple cutting and makes possible considerable reduction in scrap loss.

Guided flame cutting has contributed materially to cost reduction and has made possible greater flexibility in design. Designs may be altered to suit special customer requirements in the machines without the prohibitive expenses for changes of tooling required by other methods. In the example cited, quality of parts has been materially increased and the entire product greatly benefited.

Fig. 10. Rate of cut, oxygen and acetylene consumption. These are average values for high quality cuts.



### Form Tool Grinding Fixture

This is a simple fixture for regrinding circular form tools for a small Brown and Sharpe automatic screw machine. With this fixture held in the vise on a tool and cutter grinder, form tools can be set up for regrinding either on the radial line or off the radial line for rake and this initial positioning can be held throughout the sharpening process.

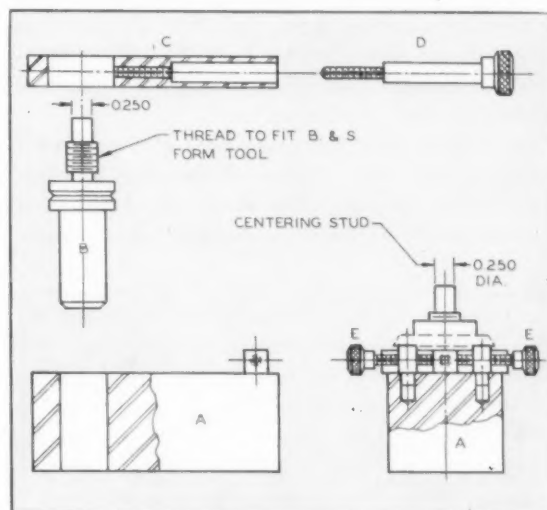
The arm *C* which is secured to the cutter post *B* by lock screw *D* is used to rotate the cutter into the wheel face for additional cuts on the face of the tool. This arrangement insures the retaining of the original face location in respect to the diametral line regardless of the amount of material ground from the tool face. The two screws *E* are used to make and secure this above movement.

This fixture can also be used to hold any type of form milling cutter, such as involute gear cutters, by substituting a proper size center post for the threaded one.

A scale or straightedge is used to make a preliminary alignment of the face of a dish grinding wheel

with the 0.250-inch diameter centering stud. A cross movement of 0.125 inch then brings the wheel into exact alignment with the centerline of the cutter.

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### Template Mask



A new technique with pressure-sensitive masking tape, protecting templates during drilling, is saving many dollars and man-hours annually. In addition template life has been increased 300 percent.

To effect this saving, 6-inch-wide strips of masking tape are used to protect the templates. It is applied solidly across the multiholed top surface of each template, and rubbed with a colored crayon to outline the holes underneath.

While holes are bored in the steel plate below the template, the resulting chips and slivers collect on the taped surface, and are merely brushed away before the next hole is drilled.

Formerly, such chips and slivers would spray up and fall into the template's other, unprotected holes. To prevent out-of-round holes or other serious damage to the template, the steel particles had to be painstakingly removed with a magnet and pick before any further drilling could be accomplished. Elimination of such delays accounts for the present savings.

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St. Paul, Minn.*

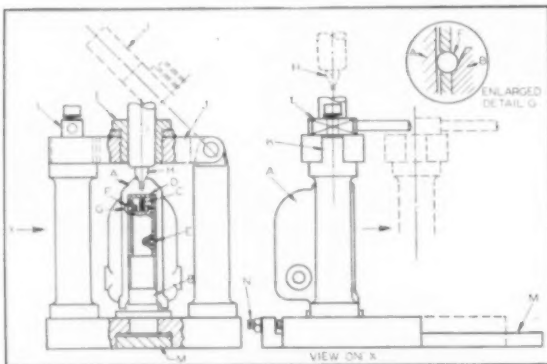


## Center-Drilling Jig for Brake Cylinders

One of the final operations on the automobile brake cylinder, *A*, is the fine boring of the main bore. For this purpose, the cylinder is supported in the fine boring machine by means of a circular locator which embraces the exterior of its open end, while the closed end is supported by means of a center. It is for drilling the center hole that the drill jig is used.

As the cylinder bore diameter is increased by only 0.005 inch during the final boring operation, it is essential that a high degree of concentricity be maintained between the centerline of the rough bore and the drilled center hole. For this reason, a rather unusual form of bore location is adopted in the drill jig.

At its lower end, the rough bore of the cylinder is located upon the exterior of the plug *B* which is secured to the base plate of the jig. Apart from a short length of location diameter at its lower



end, the plug is clear of the component bore for most of its length. The upper end of the plug is of conical form and has a pocket to house the compression spring *C* whose upper end bears upon the underside of the sliding sleeve *D*. The travel of the sliding sleeve is limited to about  $\frac{1}{32}$  inch by means of the pin *E* which acts within an elongated slot machined in the wall.

Three equally spaced holes are drilled through the wall of the sliding sleeve and each hole houses within it a  $\frac{3}{16}$ -inch diameter steel ball *F*. The balls are prevented from falling out of their holes in the sleeve by means of the peened-over outer edge of each hole, as shown in the enlarged detail *G*.

The action of the locating plug is as follows: A component is dropped onto the plug and its open end engages with the circumference of the lower portion. When the component is pushed downward under the thrust of the center drill *H*, the sliding sleeve is in contact with the bore end and is also pushed downward. This action causes the three balls to be pushed outward by the conical end of

the locating plug so that they press upon the wall of the component bore. Since the conical surface of the plug is perfectly concentric with the lower locating diameter and with the bore of the drill guide bush *I*, the rough bore is perfectly in line with the axis of the center drill.

Interference caused by any inaccuracy of the face at the bottom of the component is avoided by holding it clear of the jig; the component is located by means of its bore only. It will be apparent that downward pressure upon the component will press down the sliding sleeve and the balls will be forced outward until they are stopped by the wall of the component bore, when further axial movement of the component will cease and the drill will be able to cut.

Conversely, if pressure upon the component is released, the compression spring *C* will push the sliding sleeve upward and this will carry the balls with it, thus releasing their outward pressure upon the walls of the bore.

The advantages of this method of location are that slight variations in bore diameter are accommodated automatically; it is not necessary to push the component all the way along a closely fitting plug, thereby causing damage to the bore surface and slowing up loading, also, clamping of the component is not necessary, i.e. clamping for location purposes. The component cannot spin on the locating plug because of the jig pillars.

In order that components can be loaded easily, the guide bushing *I* which accommodates the center drill holder, is mounted in the hinged plate *J* which has a slot milled in one end for engagement with a tongue of metal *K* machined in the top of one pillar. The hinged plate is held down in place by means of the swivelling clamp *L* which has little or no upward thrust to resist and is, therefore, held down by a standard spring washer under the head of a cap screw.

Ease of loading is further facilitated by mounting the jig upon a guide plate *M* whereby it may be pulled toward the machine operator and from under the drill. After loading, the jig can be slid back under the drill until it makes contact with the stop screw *N*. The guide plate *M* is bolted to the machine table.

The components are of cast-light alloy and the jig described enables the center drilling to be performed at a speed of 5 seconds per piece.

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London, England

*Contributions for these pages describing short cuts for the tool engineer are welcome. Finished drawings are not necessary. Payment for accepted articles is made upon publication.*

# Tool Drawings to Meet Shop Needs

By E. M. Hofmann\*

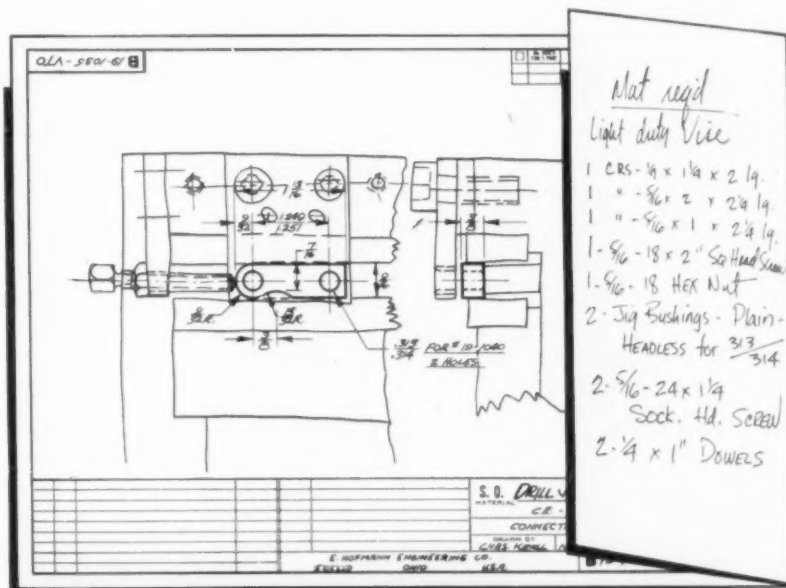
E. Hofmann Engineering Co.  
Cleveland, Ohio

THE VALUE of a drawing is established not by what the designer or draftsman draws into it, but by what the user can read from it. Standardization of drawing methods will be condemned if it goes beyond basic guidance on geometrical description of parts, specifications for size, fits and limits, development of common terminology and neglects to emphasize the effect of the drawing upon the reader. For example, specifications for microinch finishes are lost in the jobbing shop or in the tool shop for structural production. The use of terms such as light press fit will cost money in the large tool shop with departmentalized operations.

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Shops and factories producing tools range in size from the small tool shops to the large highly specialized organizations. A parts print handed by the owner-foreman to his toolmaker partner is sufficient in the small shop to produce an acceptable tool at a reasonable cost in relatively short time. A complete assembly drawing with detail drawings for the individual parts comprising the tool and including precut stock length and other information, is required in the departmental tool manufacturing shop. This is necessary to properly instruct stock clerk, schedule clerk, assembly foreman and lathe, milling or grinding foreman. For efficiency in conveying and interpreting engineer-

Fig. 1. A marked-up parts print is acceptable for small nonrepetitive runs. Materials may be listed on the back of the sheet.



ing information in the various types of tool manufacturing shops, the form of communication should vary accordingly.

A tool for short-lot production, if not procurable through a combination of standard jig elements, can easily be defined in most cases by a marked-up part print or a sketch on the back of the part print. The tool that is to assure trouble-free production of thousands of parts within tolerances, needs specifications in outline, dimensions, materials and treatments much more accurate than the quickly drawn sketch can provide. To meet the needs of various methods of parts manufacturing, the form of communication must adapt itself according to the type of shop in which it is used.

Present day manufacturing methods are more than ever dependent on a form of communication that is both precise and comprehensible in presentation. These methods require multiple sources of supply and utilize jobbing shops in various parts of the country or in foreign countries. There is an inevitable commitment to interchangeability of parts, and there are often engineering changes beyond the control of the prime manufacturer.

Tool drawings to serve their purpose must therefore be made in consideration of tool manufacturing methods, parts manufacturing methods and of the business methods governing the first two methods. A survey showing the interrelation of drawings is tabulated in TABLE 1.

### Marked-up Parts Print

The marked-up parts print Fig. 1, is acceptable for a small run of non-repetitive parts. With colored pencils the outline of the tooling can be offset for the benefit of the toolmaker. Material needs may

Table 1—Correlation of Drawings to Shop Facilities.

METHODS							
	Marked-up print	Simple sketch	Schematic tool drawings; standard design with variable dimensions	Dimensionally correct layout with reference dimensions only	Layout with details dimensioned within layout	Layout with multiple details on separate sheets	Layout with separate single detail drawings for highly specialized shops
TYPE OF TOOL SHOP							
Small tool shop; highly skilled toolmakers	x	x	x	x	x	0	
Medium tool shop with minor subdivision of work	#	x	x	x	x	x	
Toolroom preparation of preliminary parts, restricted assembly and finishing by toolmakers	0	#	x	0	#	x	x
Highly specialized toolroom, subletting tool parts manufacturing to outside jobbers	0	0	0	0	#	x	x
TYPE OF MANUFACTURING SHOP							
Small lots; simplicity of production more important than interchangeability	x	x	x	x	0	0	0
Small lots, with accuracy required; repeats	#	x	x	x	x	0	0
Medium size lots; parts produced and assembled in same shop	0	x	x	x	x	#	0
Medium size lots; parts made by outside jobber	0	0	#	x	x	#	#
Large lots; standardized products and similar pieces	#	#	x	x	x	#	#
Large lots; high accuracy; multiple sources of supply	0	0	0	0	#	x	x

be listed on the back of the print in ink and become a part of the full picture if the listing is done on a narrow margin obtained by a 3- to 4-inch fold-over. All other pertinent tool data may be listed on that margin in order to have a complete record for the files. For multiple operations, individual parts prints can be used.

This form of tool drawing is valuable for the shop that has the highly skilled toolmaker who is desirous of carrying the responsibility of creative

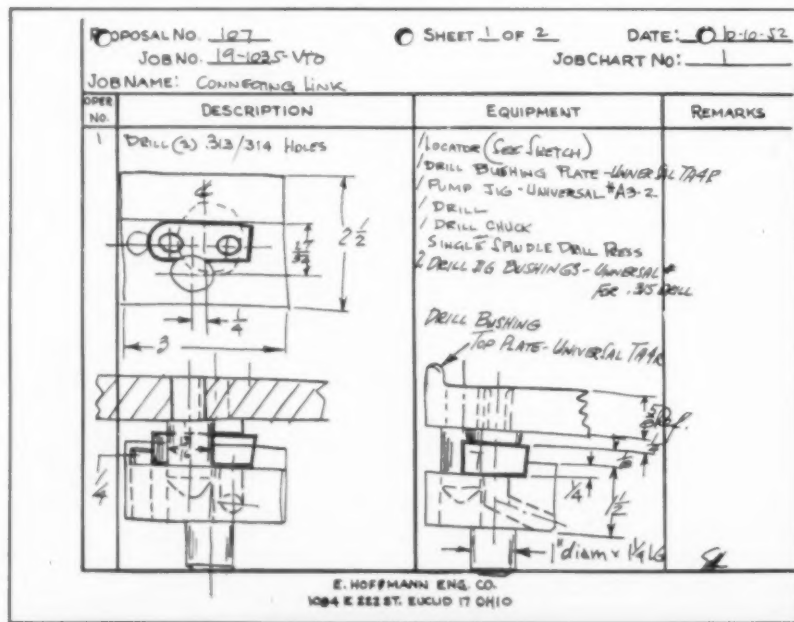


Fig. 2. When the tooling is simple compared to the part, the tool diagram may be sketched on a part print.



work. It is valuable in planning engineering for quick location of reference points in succeeding operations.

### Sketches

The simple sketch serves the need when part drawings are too complex to be used as tool sketches, or when the tool is small and simple in comparison with the size of the part, Fig. 2. The sketch must confine itself to basic outlines of the main elements of the tools. Screws and bolts to hold the tool together should be selected and located by the toolmaker, except where they have a function in the operation of the tool. Standard parts, such as jig bushings, clamps and locating buttons, should be specified by catalog number to permit pre-ordering so that they can be used for transfer of measurements and for fitting purposes instead of using dimensions. Sketches should be supplemented by sectional views to demonstrate important features. Dotted lines should be avoided.

### Dimensional Layout

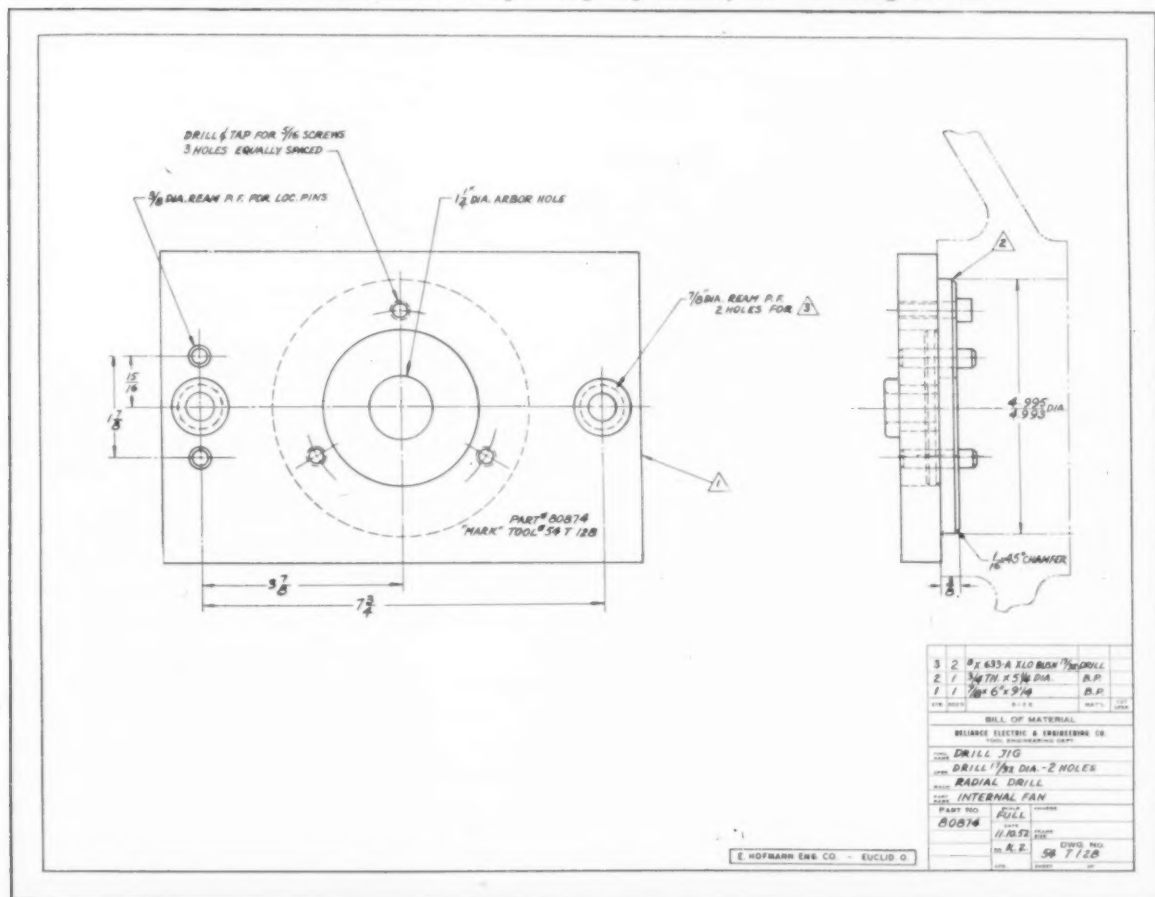
The tool layout with reference dimensions only is a widely used type of drawing in current tool design, Fig. 3. The layout is made with most de-

tails accurately shown as to size and location. Dimensions are given for center lines of drill bushings, clamps, locating buttons or pads and cutter setting gage for blocks. Material is specified for cross-sectional sizes and cut-off lengths. Commercial parts other than bolts, screws, nuts and washers are listed for purchasing. The tool print, the part print, raw material and commercial parts are delivered to the toolmaker who takes the responsibility of planning and creating the finished tool.

Like the previous two, this method of making tool drawings requires a self-contained toolroom manned with toolmakers not only skilled in the handling of machinery but also experienced in engineering.

The tool engineer is primarily concerned with the principles of locating the part and the requirements of operations, while secondary drawing functions of defining plate thickness, methods of building up bases and angles as well as the selection and location of fastening bolts, ordinarily a detailer's job, are eliminated and transferred to the final place of action. The dimensionally correct layout drawing expresses the geometry of the design and holds all other specifications to the absolute minimum.

Fig. 3. A tool layout with reference dimensions only requires a skilled machinist who will assume some of the planning responsibility for fabricating the tool.

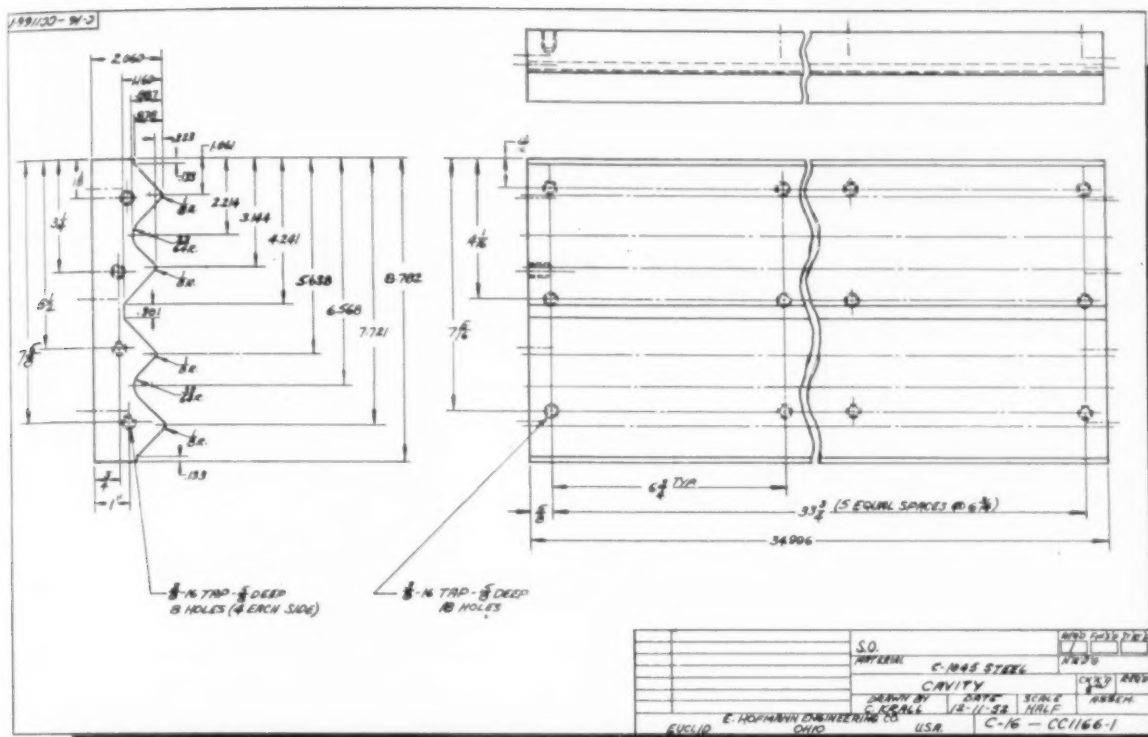


The tool layout drawing with detail dimensions within the layout are useful only on simple units where the additional lines, arrows, dimensional figures and notes do not obscure the geometry of the design, *Fig. 4*. Although this method is the most widely used, experience indicates more difficulties because of either too much or too little information in the proper places. If the tool is to be worked on by more than one toolmaker, or if

### Master Sheet with Detail Sheets

Tool layout drawings with separate details on the layout sheet or on separate sheets are efficient for most tool shops. The layout sheet establishes

[illegible]



the geometry of the design, it carries reference and inspection dimensions, it lists all commercial parts needed for the assembly and refers through a proper system of parts numbers and sheet references to the detail sheets. The detail sheet, *Fig. 5*, carries a list of all details shown on it, together with a list of material, and a list of such commercial parts as may need to be mounted or fitted with one of the listed details during some of the preliminary operations. The detail sheets can have detail parts segregated according to their major job of manufacturing.

This method of record keeping permits close control of interchangeable parts; it allows for easy standardization of tools by tabulating component details to suit different parts to be produced. From the standpoint of tool manufacturing this method makes planning, scheduling and subletting a simple clerical operation. It conserves the toolmaker's time and skill for the really important job of building the tool. More exacting quotations can be expected with drawings of this type than from any of the other methods discussed.

Tool layout drawings with separate individual detail drawings are of value for complex tools consisting of several subunits using a number of common details, or for tools and gages where the specifications and dimensions are of such exacting and special nature that the presence of other subject matter on the sheet will distract the attention, or where, if work must be done by outside

specialists, disclosure of information limited to the one detail only is warranted. Individual detail drawings are also needed for multiple manufacturing to permit building of tools on a series-production basis.

## Materials

While this discussion deals primarily with the outlines and general dimensions contained on tool drawing, the specifications for raw material and blank sizes to be used deserve equal consideration. It is customary to call for stock in terms of minimum raw material plus cutoff allowance, regardless of whether the tool is to be built in a small shop or a large organization with an extensive inventory of material in various sizes and shapes. It will be much simpler for many tool shops to know the minimum size of the tool part's outline, and let the stock clerk, foreman or toolmaker select from stock the most suitable and available form of material. For example, refer to item 11, *Fig. 4*, which calls for a  $1\frac{3}{8} \times 1\frac{27}{32} \times 37\frac{1}{2}$ -inch long piece of machine steel for a  $1.373 \times 1.833 \times 37\frac{1}{2}$ -inch mold part.

This specification will permit using preground stock, of hot-rolled stock with a 1/4-inch finish allowance, or of flame-cut plate or any other form of material available at the time. The use of 1 1/2, 1 5/8 or 1 3/4-inch thick stock of 2, 2 1/4 or even 2 1/2-inch width can be decided upon according to the availability of material or manufacturing facilities.



# Tooling and Low Cost Production

By E. A. Cyrol\*

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CENTRALIZATION OF TOOL grinding and storage, with provision for tool grinding operation incentives, can eliminate many evils which impair production efficiency. If management has provided the proper tool control, workers will find the tools in the tool crib in good condition and ready for use. Even if the industrial engineering department provides standard time and setup data and tool setup charts for the tool crib, the tools still must be physically controlled and properly maintained, or they will not be effectively used in the shop.

If the machine shop operators have been provided with tool grinders spotted throughout the shop so that they may resharpen their own small tools, then it is probable that those small tools are being ground away into the dust collectors or discarded on the scrap heap in large numbers. They are also probably being used much less effectively than intended.

At any rate, small shop managements, who have always considered tool control, and centralized tool grinding to be worthwhile only for large plants, are finding that perishable tool inventories in their shops react favorably to controlled specialized tool grinding.

In machine shops employing as few as 50 to 60 men, it is often difficult to convince management that tool control and centralized tool grinding would more than pay for itself within the first six months in tools and productive machine hours. Management is prone to believe that the foremen whose departments are involved are at fault, since they

have the responsibility that tools are properly used and stored. The fact is that, without a control system provided by management, the foremen are powerless to carry out the program.

When machine operators grind their own tools, their machines are idle at least during the time they are grinding the tools. Of course, they may be idle much longer than that, because the operator may find the grinders in use. The machine down time will include waiting for the grinder and other time-consuming delays. Since inexpertly ground tools fail oftener, there are more and more of these trips to the grinder.

During the present high level of employment, most plants have their share of new operators, and tools are lost beyond any possibility of salvage through experimentation in the hands of such operators. As a matter of fact, the more inexperienced the machine operator, the more tempted he will be to reshape his tools.

For example, such an operator may find that a reamer can be made to ream slightly oversize if the tip is ground. If the center is ground off, the reamer can never thereafter be properly ground on centers. The tangs of taps are ground down and such taps find their way to the scrap heap in short order. Tungsten carbide tools are ground on improper wheels, and the resulting damage quickly eliminates them from production.

Observation of everyday machine shop practice shows that a great amount of tool life is lost through special hooks and clearances that inexperienced machinists add to their cutting tools. The result is an early failure of the cutting edge be-

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cause of reduced support or concentration of heat at the point. Moreover, it is the conventional procedure for an operator from one shift to remove all such special hooks, clearances, rakes, etc. and add his own before using the tools.

Specialized equipment can produce work much superior to off hand grinding through the use of universal equipment. Furthermore, a machine operator can hardly be expected to know the proper grinding wheels and proper grinding speeds.

It is generally agreed that properly ground and cared for carbide inserted tools outlast and outperform steel cutting tools. In untrained hands, the advantage is quickly nullified while costs are increased.

In a centralized grinding setup, blue prints of all tools in the plant can be kept on file, and the tools reground each time to the proper dimensions and sent out to the job literally as good as new. A higher grade of personnel can be employed in such

an organization than is available, on the average, for machine shop work.

Men chosen for grinding room work can be trained in the best known methods and they can be expected to develop short cuts from the experience of constant handling of similar tools. They can be held responsible for the performance of the tools ground by them to a greater degree than could machine operators. These men are supervised not only by their immediate superior but also, in effect, by the foreman in whose department the tools are used and by the man using the tools, who will not cover up poor grinding as he would if it were his own work.

Further control over perishable tools can be obtained from the use of standardized forms. An excellent example of such control is the combined standard data sheet and tool setup chart, Fig. 1, used by the Ajax Iron Works. In this case, the data sheet and setup card are combined in one pad

Fig. 1. Using combined standard data sheet and tool setup card is one step in cutting production costs.

**SETUP CHART**

DATE \_\_\_\_\_

Part No. \_\_\_\_\_

Part Name \_\_\_\_\_

Operation No. \_\_\_\_\_

Operation \_\_\_\_\_

Dept. \_\_\_\_\_

Mat. \_\_\_\_\_

Machine \_\_\_\_\_

Code No. \_\_\_\_\_

Run Time Per Pc. \_\_\_\_\_

Allowed Setup Time \_\_\_\_\_

**HANDLING ELEMENTS**

Task	Wgt.	Line
Unload and Load from Table No.	1 A	4 A
Tighten and Loosen in Fixture from Table No.	1 A	4 A
Gauging from Table No.	1 A	4 A
Loosen and Tighten Chuck	15	15
Average	20	20
Heavy	30	30
Loosen and Retighten Chuck Jaws	15	15
Blow or Brush out Chips	15	15
Change Tool in Slip Chuck	15	15
Change Tool in Taper Holder	15	15
Oil - Tap - Plug - Bar or Reamer	15	15
File Bore or Break Corners	15	15
True-up by sight	15	15

**TOTAL ADDITIONAL ELEMENTS**

Task	Wgt.	Line
1	15	15
2	15	15
3	15	15
4	15	15
5	15	15
6	15	15
7	15	15
8	15	15
9	15	15
10	15	15

**AJAX IRO TURRET LATHE STA**

Part Name \_\_\_\_\_

Operation \_\_\_\_\_

Machine Name \_\_\_\_\_

**TOOL SETUP CARD**

Part Name \_\_\_\_\_

Part No. \_\_\_\_\_

Operation No. \_\_\_\_\_

Description \_\_\_\_\_

Jig or Fixture Code No. \_\_\_\_\_

Name of Fixture \_\_\_\_\_

**TABLE 1 MANUAL UNLOAD AND LOAD**

WGT. MIN.	WGT. MIN.	WGT. MIN.
1 12 11 15 20	20	20
2 12 12 15 20	20	20
3 12 12 15 20	20	20
4 12 12 15 20	20	20
5 12 12 15 20	20	20
6 12 12 15 20	20	20
7 12 12 15 20	20	20
8 12 12 15 20	20	20
9 12 12 15 20	20	20
10 12 12 15 20	20	20

**TABLE 2 CLAMP IN FIXTURES**

Task	1	2
Set Screws	40	70
Slotted Clamps	20	44
If Remove Note Add	20	35
Bar Clamp	60	110
Bar Clamp For Piston Rods Over 1 1/2"	150	200

**DOWN TIME ALLOWANCE**

Type of Allowance	Minutes
Personal	
Unavoidable Delay	
Tool Care	
Rph.	
Pin.	
<b>TOTAL DELAY</b>	
<b>PER CENT</b>	
Computed by	
Date of Study	
Checked by	
Approved by	

**Remarks:**

TOOL GRINDER INCENTIVE REPORT SHEET NO. 1			
Emp. Name _____		Clock No. _____	
Allowed Hrs. _____		Actual Hrs. _____	
	Quantity	Allow Hrs.	Allow Hrs. per tool/sharp
<b>1. GENERAL ITEMS</b>			
Make out report sheets			045
Fetch in and out for day work			025
Make out tool requisition form			150
Get parts from crib in bldg. 2 (halves crib)			064
Get parts from crib in bldg. 2			050
Remove worn grinding wheel and replace with new wheel			
<b>2. SHARP CUTTERS, HOLLOW MILLS, END MILLS &amp; SPOT FACERS</b>			
Set-up		271	
"Turn-out" on No. 2 Cutter Grinder		012	
"Turn-out" on No. 2 Cutter Grinder		045	
Get job, check table and change holder (once per each different tool)		041	
Turn head 180, change arbor, etc. (once per each different tool with lat stop 2" or longer)		033	
<b>SHARP CUTTERS</b>			
12000 1/2-20		196	
Service - Garing B-0476-02		153	
Service - Garing B-0476-04A		160	
Repair stop cutter (2000 1/2-20)			
Set-up lathe		036	
Turn down and set off end of tool		153	
Set-up No. 2 Cutter Grinder		362	
"Turn-out" (fines and grind clearance angles)		326	
<b>SPOT FACERS</b>			
1/8"		074	
1"		070	
<b>HOLLOW MILLS &amp; END MILLS</b>			
5/32"		066	
1/16"		072	
<b>3. MILLING CUTTERS</b>			
Set-up		160	
Place 5 remove cutters on No. 12-67 (per cutter or set)		047	
Get arbor, center wheel, check chart, etc. (once per each different cutter)		106	
3" x 9/16" 30 teeth 12 as a time		093	
3" x 3/8" 10 teeth fast of 21		137	
3" x 1/2" 10 teeth		108	
3" x 5/8" 10 teeth fast of 40		279	
4" x 1/16" 40 teeth		135	
4" x 1/16" 40 teeth (13300-T-24)		351	
<b>4. STANDARD 5. EXPANSION BEARERS ON #2 CUTTER GRINDER</b>			
Set-up		254	
Adjust tool stock, table, grinding wheel, etc. (once per each different tool)		008	
5/8"		035	
Service - 626"		035	
1/8" lathe		072	
Service - 1/8" lathe		043	
1/16"		047	
McCrack 1"		049	
McCrack 1 1/8"		054	
McCrack 1 3/8"		056	
<b>REPAIR MCCRACK EXPANSION BEARERS</b>			
Set-up		419	
Set-out blades and sharpen (per round)		412	
New blades		071	
Per round		037	
Per blade removed			
Sub Total Allowed Hrs.			
*Total Allowed Hrs.			

Fig. 2. Example of tool grinder's incentive report.

in such a way that as a tool setup is written out on the back of the standard data sheet, a carbon copy appears on the setup card. Recorded on the data sheet are all necessary figures for determining standard times for various operations with the setup chart to record the tools and prescribe the feeds and speeds at which they are to be used. The tool setup card goes to the tool crib where the tools are stored, and the card returns with the tools to the machine operator. On the card are the operator's time allowance for the job and the job instructions.

**Inventory Reduction:** Centralized tool grinding usually permits the development of a well-balanced and smaller tool inventory. There is less discarding of small tools such as drills, taps, and reamers to the scrap heap purely on the basis of their worn appearance, as is often the case in the shop. With centralized tool grinding, an effective tool salvaging program can be inaugurated with the authority and responsibility definitely allocated.

Reduction in grinding wheel inventory is also possible because the wheels are more correctly dressed and mounted and are used more completely

than in the shop, and the designated type and grade is employed for each job.

If templates are necessary, a smaller number of them will be required in the grinding room than would be necessary for proper distribution in the machine shop. Standard tungsten carbide bits can be stored and reshaped in the grinding room if necessary, thus both reducing the inventory of special bits carried and making the required tool available in the shortest possible time.

Carbide tool life can also be prolonged because expensive carbide tools can be recalled after so many hours of cutting time and the cutting edges inspected and reground before damaging break-away of the edges or total failure occurs.

**Savings:** Cutting feeds and speeds can be increased and machining time decreased only if the tools are properly maintained under instructions from the tool design department. It is almost impossible to determine tool life when cutting tools are not controlled through the tool crib and reground under a centralized grinding system.

A conservative estimate of the savings that can result from tool control and centralized grinding system ranges from 10 to 20 percent of the entire cutting tool expense. These are usually the net savings after the tool crib and tool grinding expenses have been subtracted from the total savings.

**Tool Maintenance Incentives:** The benefits of centralized tool grinding can be increased considerably by placing the grinding room operators on an incentive plan. While the regrounding of worn tools is a maintenance labor classification, it can be placed successfully on an individual direct incentive basis with desirable results. Tools are accurately and rapidly handled, assuring maximum tool life and permitting operations with the smallest investment in tool inventory.

In one instance, fifteen tool grinders on a day-work basis were required to service the machine shop of a plant employing approximately 2,000 people. This work was put on incentive while the plant grew to 3,000 employees, with the result that the number of tool grinders, instead of increasing, decreased to ten. Few complaints about improper grinding of tools result from the faster pace presumably required by the incentive plan.

With the aid of time-study observations, a thorough examination of the grinding methods, work patterns, flow of the work, and equipment is made. The perishable tools that are brought in for reconditioning are segregated and classified, and the actual time study is begun. It is important that the difference between the time study procedure as it is used in this work and as it is used in direct labor classifications be clearly recognized. The purpose of a



time study in the indirect area is to provide elemental breakdown and elemental standard data; not to provide a production rate.

Time values from each time study are posted on summary sheets according to the elemental breakdown. The constant values are determined by averaging the elemental times; the variables are plotted on graph paper and the curves drawn. Tables of figures are then drawn up from the graphs for simplicity of application. All-day studies are taken to determine the allowance for personal, cleanup and unavoidable delays. Setup times are similarly established.

These times are then summarized. This is the raw data which are used to determine the standards. Actually, once these data are developed, no more time study need be done if the methods and types of tools remain the same.

For example: To determine the standard for re-grinding a  $\frac{5}{8}$ -inch diameter standard reamer, the values determined by the time study are used. The

tool grinder incentive report sheet, Fig. 2, is developed and used by the tool grinder to report production to the timekeeper and payroll clerk.

The timekeeper or payroll clerk extends all production reported by the standard hours allowed for each day. The total earned hours are then compared with the total hours worked. If earned hours exceed hours worked, the operator receives pay for the earned hours at his guaranteed minimum. Each operator's earnings are based on his individual performance with no limits recognized as required under good incentive wage practice. Poorly ground tools are handled in the same way as when an operator on direct work scraps a part.

The formula for good tool usage economically obtained is simple. Provide the machine operators with properly ground tools; give them clear instructions as to the feeds and speeds to be used with each cutting tool; provide a centralized tool grinding room where tools may be quickly ground under a wage incentive.

## X-Ray Analyzes Thin Coatings

THE PROBLEM of identification and quantitative analysis of minute amounts of elements present in small deposits or thin film is being solved through a recently developed X-ray technique. Announcement of the development was made by the Research and Control Instruments Division, North American Philips Co., Inc.

During laboratory tests dealing with thin films on stainless steel and component metals deposited on plastic and metal base materials, coatings of six micrograms per square centimeter or less were identified. In fact, the technique easily determined percentages of chromium and nickel present in a specimen of 18-8 stainless steel where one square centimeter of the film actually contained about one microgram of chromium and less than one-half microgram of nickel.

In operation, the instrumentation involved is a standard X-ray spectrograph employing tungsten radiation, but using a special analyzing crystal with newly developed optics. Each specimen is scanned and the spectrum recorded through an angular range suitable for those elements involved. Intensity is measured with the scaler and fixed count operation. The accompanying table shows typical analyses.

Possibly the most distinct advantage of the method over former techniques is that it is non-destructive. The films are not ruptured or decayed as they would be in spark spectrographs. In that method the film is ruptured or dissipated at the point where the arc strikes, the metal evaporating

with a resultant erroneous determination. As opposed to this, the new method can be used not only as a precise method of measurement, but also one which leaves the specimen intact.

Industrially, in the processing field, several distinct potentialities exist. With an eye to control, evaporation may be checked through rapid analysis of rates of deposits from solvents or through checks on tiny quantities of condensate. Flash coatings used for protective and decorative purposes can readily be controlled as to thickness, a process heretofore tedious and difficult as well as often inaccurate. Both the output of hazardous smoke and the recovery of what are often valuable by-products may be important fields for the X-ray spectrograph.

Machine friction may now be susceptible to more efficient attack by analysis of thin films which may give clues to the transfer of metals or the formation of superficial alloys under heat and pressure, or the degeneration of bearing surfaces due to chemical interaction with constituents of lubricants.

At the same time, the method may well become useful in the metallurgy field for studies of molecular or atomic migration at interfaces, especially in the case of laminated metals.

Specimen	Actual Deposit (Micrograms/cm <sup>2</sup> )	Counts/Sec (in air)	Counts/ Micrograms
Chromium on Mylar	9.9	84.0	8.5
Nickel on Mylar	10.4	280.0	26.9
Iron on Mylar	12.8	210.0	16.4



## Improving Band

Fig. 1. Saw band cutting plastic reveals how chips form in the gullets. Improperly shaped gullets cause the chips to jam.

**T**O IMPROVE THE PERFORMANCE of a cutting tool frequently involves research and complex determinations which at first seem abstract and academic but which later bear fruit as concrete results. A case in point is the research conducted by The DoAll Co. in stress analysis on band tools. In use, these tools are subject to much flexing, tension and strain, *Fig. 1*. Such factors increase the susceptibility of a tool to breakage, *Fig. 2*.

Broadly, a band tool is subject primarily to two types of breakage—band breakage and tooth breakage. From past experience it has been found that these problems are closely related to gullet form, i.e., the form of gullet curvature. For example, a band tool is naturally weaker at the gullets because it is narrower at these points. Also, the gullet acts as a stress raiser. Again, the gullet is subject to additional stress because of the leverage exerted against adjacent teeth as they cut into the work. A tooth, as it cuts into the work, is pressed away from the gullet contiguous with the tooth face and toward the gullet contiguous with the tooth back. Consequently, the gullet areas between teeth are alternately stretched and compressed.

Gullet form is also related to chip flow, i.e., the formation and curling of the chip as the tooth cuts into the work, *Fig. 3*. This chip flow characteristic is an important factor in tooth breakage.

Chips are normally compressed in the gullet because of the confinement of the band in the kerf and the pressure of the band against the work. When the tooth leaves the kerf, the chip should expand like a coiled spring and fall away from the gullet. If the gullet is not of sufficient capacity or is not of proper contour, the chip may jam and remain in the gullet. In this case, it can travel with the band around the band wheels back to the work. Should the chip bind in the work, an extreme impact is delivered to the face of the tooth. Frequently, this impact is sufficient to break the tooth.

### Gullet Shape Determines Strength

From the standpoint of chip flow and band strength in the area of the gullet, it is desirable that the gullet form does not embody sharp or deep curvatures since such configurations render the band more susceptible to breakage from flexing and also, in effect, constitute pockets into which a chip can jam. Actually, it has been found that with broader and smoother gullet curvatures from the back of one tooth to the tip of the next, the gullet is stronger and proper chip flow is enhanced. A broader and smoother curvature, in essence, makes for a shallower gullet, *Fig. 3*, and thereby broadens the tooth,  $W$ , at a given tooth height,  $H$ . This provides firmer anchorage for the tooth on the band, which is highly desirable, *Fig. 3*. However, shallower curvatures decrease overall tooth height,  $OH$ . Broadening the gullet curvature to the extreme, teeth would be nonexistent. For a given pitch, a compromise must be effected between broadness of gullet curvature, depth of gullet, tooth height and shape.

In effecting such compromises, however, other elements must also be considered. Typical of these

# Tool Performance

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are "set," i.e., the bend of teeth to each side of the band, and also the flexing action to which a band is subjected in use.

In tempering a band it is necessary, of course, to attain maximum hardness in the teeth for efficient cutting performance but considerably less hardness from the belly of the gullet to the back of the band so that the band retains the necessary flexibility. The full-hardness area is therefore terminated near the tooth base as shown in *Fig. 4*. Some degree of hardness is retained near the base in order that the set (side bend) of the teeth be held when pressure is exerted against the sides of the band during a sawing operation. This side pressure (from the walls of the kerf in the material being sawed) can collapse the set, i.e., push the teeth back into alignment with the band, unless the set is rigidly held.

**Fig. 2.** Section of a worn friction band saw. Even though the teeth are essentially intact, failure developed in the gullet area of the band.



In this connection, tooth height (or gullet depth) is a factor since the set of a taller tooth can be more easily collapsed than that of a shorter tooth receiving an equal amount of side pressure because of the mechanical bending advantage.

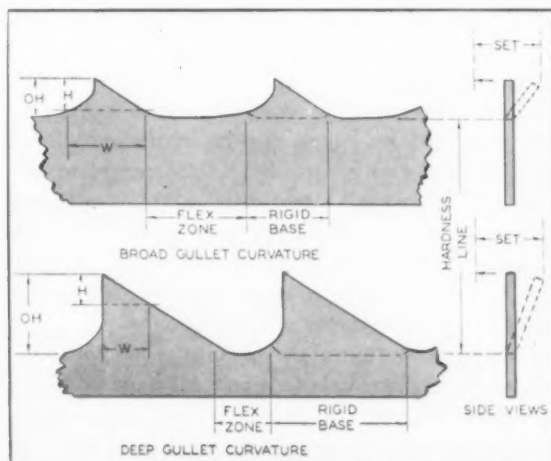
For the same reason, in putting the set on saw bands it is easier to set teeth of greater height. When setting very short teeth, the setting tool may leave marks in the gullet areas because of the proximity of this area to the line at which the setting tools strikes the teeth. All these factors must be considered in determining tooth height for bands of different width and gage. Also entering into the selection of an optimum gullet contour is the operational factor of flexing. Flexing stress or distortion concentrates in the gullet areas of the band since it is narrower at those points. The band at the deepest part of the gullet receives the most flexing so that with a deeper gullet, *Fig. 4*, a smaller area absorbs this flexing punishment. With a broader gullet this distortion is distributed over an area several times greater. In this particular instance the broad gullet offers an advantage.

Here again, in the factors related to set and flex, a counterbalancing of advantages and disadvantages is observed and these must be compromised in establishing final gullet form.

## Chip Flow Is Dependent on Material

Certain other operational factors are also considerations in the design of gullet form. For example, different materials cause different results in regard to chip flow, stress creation and cutting performance. Furthermore, the tooth and gullet design which would enable one type of band to render peak performance on one machine in cutting a given material may not provide peak performance in cutting the same material on another type of

**Fig. 3.** Tooth forms for both broad and deep gullet designs. Tooth height, width, flex zone and set angle are modified by changes in curvature.





machine. However, for reasons of practicability and economy band tools must be versatile. In this regard, it is obviously impossible to manufacture and stock the number of band tools which would be required for every type of band machine and every type of material. Band tooth and gullet design on standard stocked bands is therefore a compromise of the requirements for a variety of applications so that the band tool renders optimum performance on all these applications.

### Photoelasticity Aids Analysis

One type of study used for determining optimum gullet form for various types of bands is photoelastic stress analysis, which permits examination of the stresses and strains set up in a plastic model. The plastic band, carefully machined into a replica of a saw blade section, is clamped at each end in a tensile testing machine and then polarized light is passed through it. The transmittal characteristic of polarized light is changed as it passes through the band in accordance with the patterns of stress created in the plastic. These are the lines evident in Figs. 4, 5 and 6. An increase in tension is reflected in an increase in the number of stress lines. It is the spacing and distribution of these lines with respect to tooth and gullet form that is of importance to the research engineer.

Concentration of stress lines is indicative that the area in which this occurs is under comparatively great stress gradient. These stress-concentration areas appear for the most part in the gullets. It is desirable in gullet design to spread these lines apart to distribute the stress gradient over a greater portion of the tooth and gullet profile. From the data gained in this manner the most desirable gullet design is evolved. Through this and supplementary types of study, the optimum gullet form can be developed for the various types of band tools.

### Combines Best Features

A brief example of how the stress studies contribute to gullet design is afforded by the accompanying stress photographs of models of buttress type saw bands. Where the gullet is very flat, Fig. 4, a marked stress gradient occurs in the corners but uniform stress occurs in the middle of the gullet. On an intermediate development model, Fig. 5, good overall stress distribution is obtained although stress concentration is evident in the middle of the gullet. The gullet form, Fig. 6, utilized in the buttress band manufactured today, combines the good features of both designs.

The stress patterns shown in the photographs are for bands in simple tension. All bands operate in a state of rather high tension in order to cut straight and stay on the wheels. This condition can

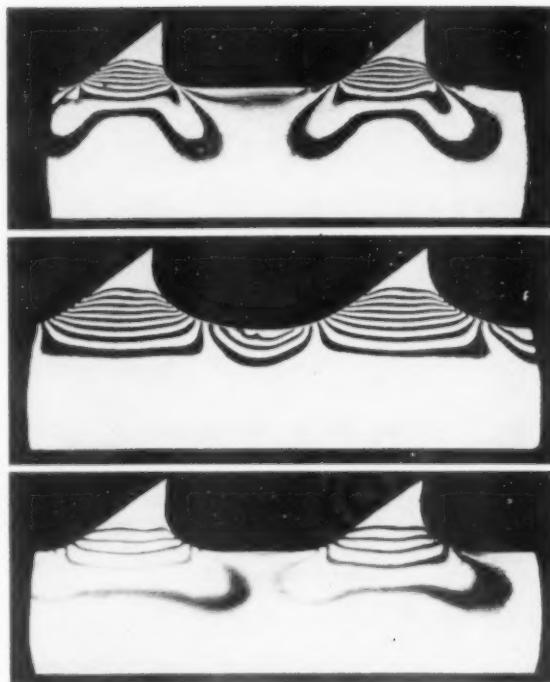


Fig. 4 (top). Stress pattern of a buttress saw band with flat gullets shows concentration in the corners of the gullet and little stress in the middle of the gullet.

Fig. 5 (center). Intermediate development model of buttress saw band shows good distribution of stress although stress has developed in the middle of the gullet.

Fig. 6 (bottom). Stress photograph of a buttress type band resulting from stress studies and being manufactured today. The design is a compromise between gullets shown in Figs. 4 and 5, combining the good stress distribution of the latter with the advantage of stress reduction in the gullet of the former.

be considered as the base load, all other loads, such as the eccentric loading caused by the cutting action, being additive. The discussion and the illustrations pertain essentially to improvement in notch (or gullet) sensitivity to tension. When the optimum gullet shape is achieved, according to studies under simple tension, the saw band has greater capacity to absorb the additive stresses occurring when actual cutting is taking place.

Actual sawing presents stresses tangential to the gullet curve and at right angles to the tooth sides. The latter tend to squeeze out the set. By making changes in the gullet curvature to give greater spacing to the stress lines in the gullet region of the plastic models under tension, a more functional tooth is evolved, both with respect to chip flow and to structural strength. Further changes in the tooth form are possible for greater tooth strength, but the necessity for economic toothing in comparison to the small gain involved rules this out except as a specialty item.

The result of this research utilizing photoelastic analysis techniques was a perceptible increase in buttress saw band life and performance.

# The Machinability of Cast Steels

By Norman Zlatin\*

John F. Kahles\*

Charles W. Briggs†

MANY STEEL CASTINGS are used by all industries in the machined condition and yet there exists very little definite information, readily available, regarding their machining properties. This lack of machinability data has placed the steel foundries at a distinct disadvantage. In many cases, it has given rise to the misconception that all cast steels possess identical machining characteristics. The truth of

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This article presents machinability data for cast steels that have not been generally available to industrial users of castings. Based on Research Report No. 27 published by the Steel Founders' Society of America, to its member companies the study summarizes an investigation carried out by Metcut Research Associates, Cincinnati, Ohio.

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this statement can be determined from an examination of commercial machining recommendations, which tend to group all cast steels under one large machinability heading.

Up to this time little work has been done to develop criteria which could be applied to determining the speeds and feeds required to machine steel castings efficiently. Furthermore, little information has been collected regarding the importance of steel microstructure, hardness and tensile strength on the machinability of cast steel.

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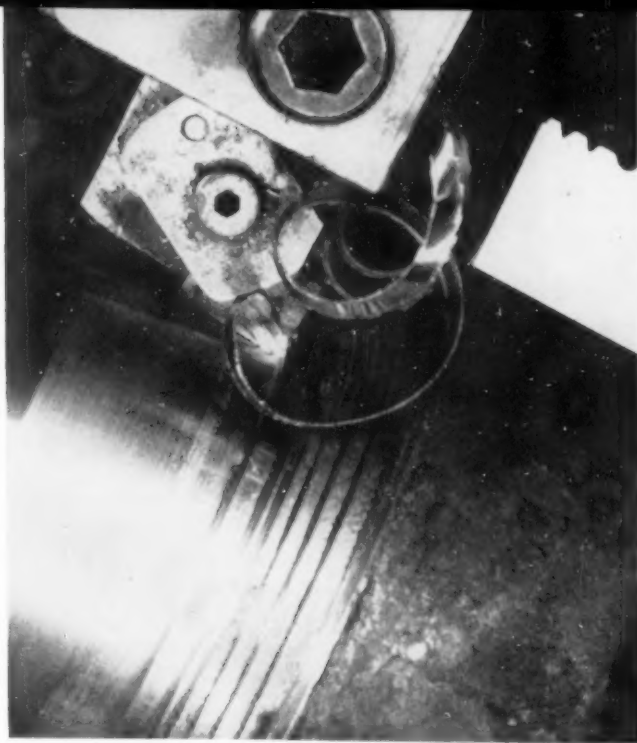


Fig. 1. Inserted carbide tool used for machining of cast steels is shown here at work.

The attainment of high production machining at low cost requires careful analysis of the machinability problem. It is the purpose of this discussion to concentrate on these aspects, one of which is the microstructure of the steel. The seven cast steels studied represent diversified types of cast steel widely used by industry. The microstructure of most other cast steels can be correlated with these test steels and thereby a satisfactory estimate of cutting conditions can be made.

Steel castings, in many cases, are delivered to the customer in the normalized condition. This is not necessarily the heat treatment which produces optimum machining properties. However, it is not suggested that the heat treatment for optimum machinability be employed in all cases. The production requirements must be large enough and the tool and time savings great enough to offset the additional heat-treating costs. Furthermore, of course, strength requirements and application must be considered. Nevertheless it must be emphasized that microstructure is an important consideration.

The casting skin, sand inclusions and subsurface discontinuities are definitely detrimental to tool life. In fact, the misconception that all cast steels machine alike may have arisen from the fact that the skin of castings machines poorly. It is suggested that approximately one half of the cutting speed recommended for the subskin metal be utilized in order to obtain equivalent tool life in machining the skin.

Tool life is usually stated as the amount of

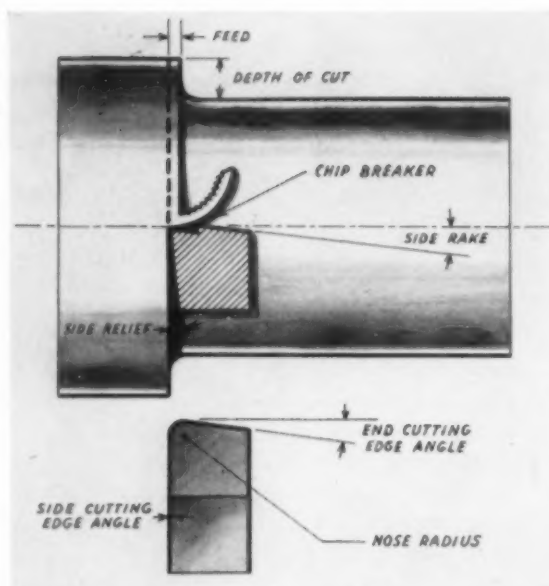


Fig. 2. Tools employed in the tests for tool life in machining cast steel were ground as shown. Standard values as given in Table 1 were used.

machining that can be done between tool grinds. If the machinability of the material can be improved, it is reflected in a higher tool life—more material machined per tool grind. Tool life is given in cubic inches of metal removed in a definite time in minutes.

The degree of wear or dullness at which the tool is removed from service is also a standard condition. Tools fail by breakdown of the cutting edge, especially at the high cutting speeds. However, at low speeds the tool life becomes so great that tests must be stopped to conserve the steel.

The aim in machinability control is to attain the optimum combination of tool life, production rate, power input and surface finish. This aim is usually most easily achieved through study of tool life. Moreover, improving tool life practically always improves production rate and surface finish as well.

### Test Methods

The steel bars that were selected for study were cast  $3\frac{1}{2}$  inches in diameter and 18 inches long, and were pressure blasted; otherwise the casting skin was not touched at the foundry. The hardness of all test bars was checked before, during, and after the machining test runs on a Brinell hardness tester.

**Turning Tools:** Both carbide, Fig. 1, and high-speed steel tools were employed. The carbide tools were tipped with 78B blanks,  $\frac{1}{4} \times \frac{1}{2} \times \frac{5}{8}$  inch. The high-speed steel tools used were Vanadium alloys, Redcut Superior, an 18-4-1 composition. Two sizes were utilized: For the skin tests,

tools measuring  $\frac{1}{2} \times \frac{1}{2} \times 4$  inches were employed and, for the base metal, the tools measured  $\frac{1}{4} \times \frac{1}{4} \times 2$  inches.

All tools were ground as shown in Fig. 2. A chip breaker was employed on the carbide tools. It was ground to a depth of 0.012-0.015 inch and a width of 0.060-0.075 inch. Standard values for tool grinder incentive report sheet, Fig. 2, is developed the tool grinding are given in TABLE 1.

The high-speed steel tools were ground on a standard Cincinnati No. 2 cutter and tool grinder equipped with a Norton  $3\frac{1}{2} \times 2\frac{3}{4} \times 1\frac{1}{2} \times 1\frac{1}{4}$ -inch cup wheel, No. 38A46 - K5VBE. The carbide tools were rough ground on a standard Delta tool grinder. For roughing purposes, a silicon carbide green grit wheel was employed. The tools were finish ground on a standard Cincinnati No. 2 cutter and tool grinder equipped with a resinoid bonded 3-inch diameter diamond cup wheel, 150 grit. The chip breakers were ground on a K.O. Lee chip breaker grinder using a 180-grit resinoid bonded diamond wheel.

Final tool-life point for the high-speed steel tools was determined either by a complete breakdown of the nose of the tool or by a wearland of 0.060 inch on the tool flank, whichever occurred first. The carbide tool end-point was based on the

Table 1—Standardized Cutting Tool Test Conditions

Tool Shape	HSS	Carbide
Side rake, degrees	15	6
Back rake, degrees	0	0
End cutting edge angle, degrees	5	6
Side cutting edge angle, degrees	0	6
Relief, degrees	5	6
Nose radius, inches	0.005	0.040
Depth of cut, inches	0.062	0.100
Feed, inch per revolution	0.010	0.010

development of a flank wear of 0.015 inch or a localized failure of 0.040 inch. A Brinell microscope was used to measure the width of the wearland.

### Turning Tests

Turning tests were conducted on an American Pacemaker engine lathe, equipped with variable-speed drive. The test bars were chucked at one end and supported with a center in the tailstock. Tool life was tested at the following speeds:

High-speed steel tools:

40-220 fpm, depending upon the steel, in steps of 20 fpm

Carbide tools:

300, 500, 800, and 1500 fpm with the exception of Mn (1330) which was also tested at 200 and 250 fpm and Ni-Cr-Mo (4340) which was also tested at 400 fpm.

Timed with an electric stop watch, the test results were plotted as both cubic inches of metal removed and tool life in minutes versus cutting



speed in feet per minute. The high-speed steel tests were made at a depth of cut of 0.062 inch and a feed of 0.010 inch per revolution. The carbide tests employed a depth of cut of 0.100 inch and a feed of 0.010 inch per revolution and were run dry, whereas Sun soluble oil at a 25 : 1 ratio was utilized in the high-speed steel tests.

### Machinability Curves for Cast Steels

Data on the machining of cast steels are plotted on tool life vs. cutting speed charts. Figs. 3 and 4 show composite data using high-speed steel tools, while Figs. 5 and 6 are composites for carbide tool cutting data.

The turning tests prove conclusively that microstructure has a marked effect on the machinability of cast steels. In some cases, it was possible to improve the machining properties of a cast steel as much as one to two hundred percent by changing the structure through controlled heat treatment.

Brinell hardness cannot be taken as a definite guide to predict machining characteristics by turning. As would be expected, the plain carbon steels machine better than the alloy steels for a given structure.

In general, it is recommended that the plain carbon cast steels be machined with carbides in the speed range of 400 to 600 fpm, and the alloy cast steels, in the range of 200 to 400 fpm. If

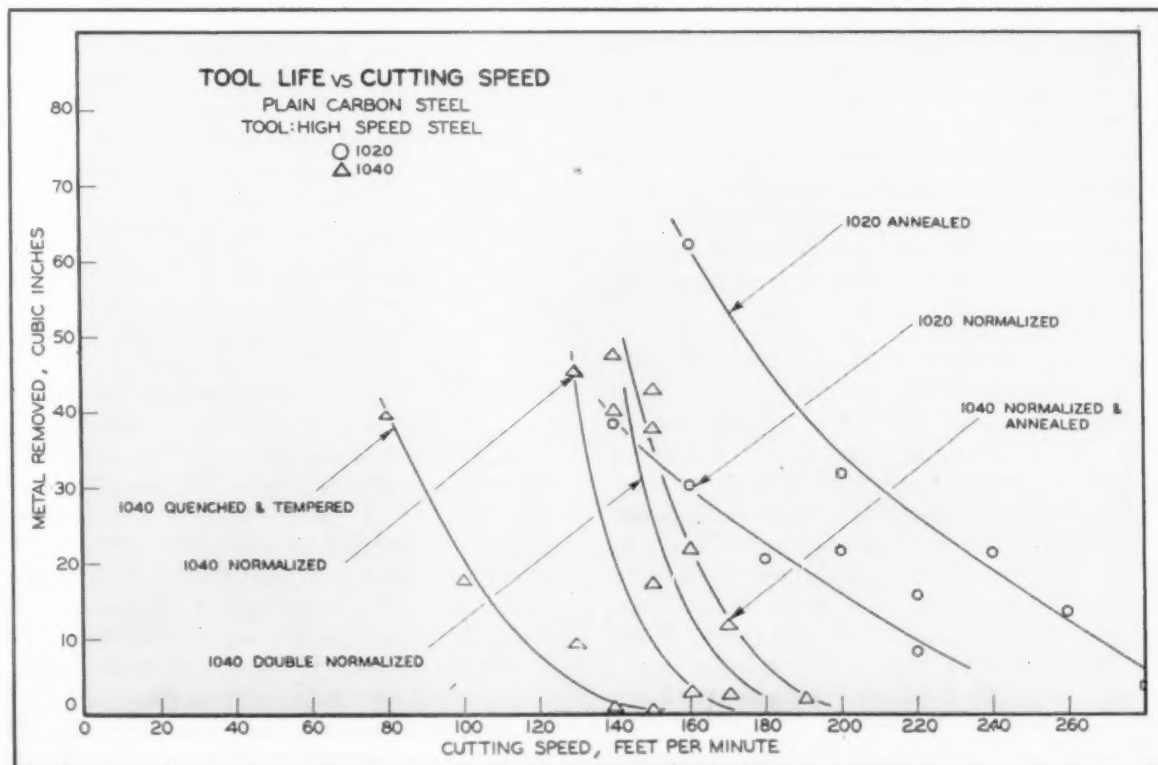
high-speed steel tools are used, then the cast steels should be machined in the 40 to 180 fpm range.

**Carbon Cast Steels:** It is interesting to observe the wide spread of tool life obtained in machining a given plain carbon steel (1020) in two different microstructural forms (annealed and normalized). It is possible to machine the annealed steel with carbide tools at a cutting speed 85 percent higher than the normalized steel in order to obtain equivalent tool life. At 300 fpm, almost twice the metal removal can be expected for the annealed form of the steel. This difference in machining characteristics is obtained in spite of the fact that the two forms are of similar hardness, 122 to 134 BHN. Annealed 1020 steel can be machined with high-speed steel at a 25-percent higher speed than the same steel in the normalized condition.

Another plain carbon cast steel, 1040, was machined in four different microstructural forms: normalized and annealed, single normalized, double normalized, and normalized and oil-quenched. The oil-quenched heat treatment was used solely to obtain the type of structure found in thin normalized sections.

The double normalized heat treatment which produced a microstructure of 60 percent blocky ferrite and 40 percent pearlite can be machined with carbides at a speed 50 percent higher than the single normalized form, with a structure of 35 percent network ferrite and 65 percent pearlite.

Fig. 3. Tool life vs. cutting speed when machining carbon cast steels with high-speed steel tools.



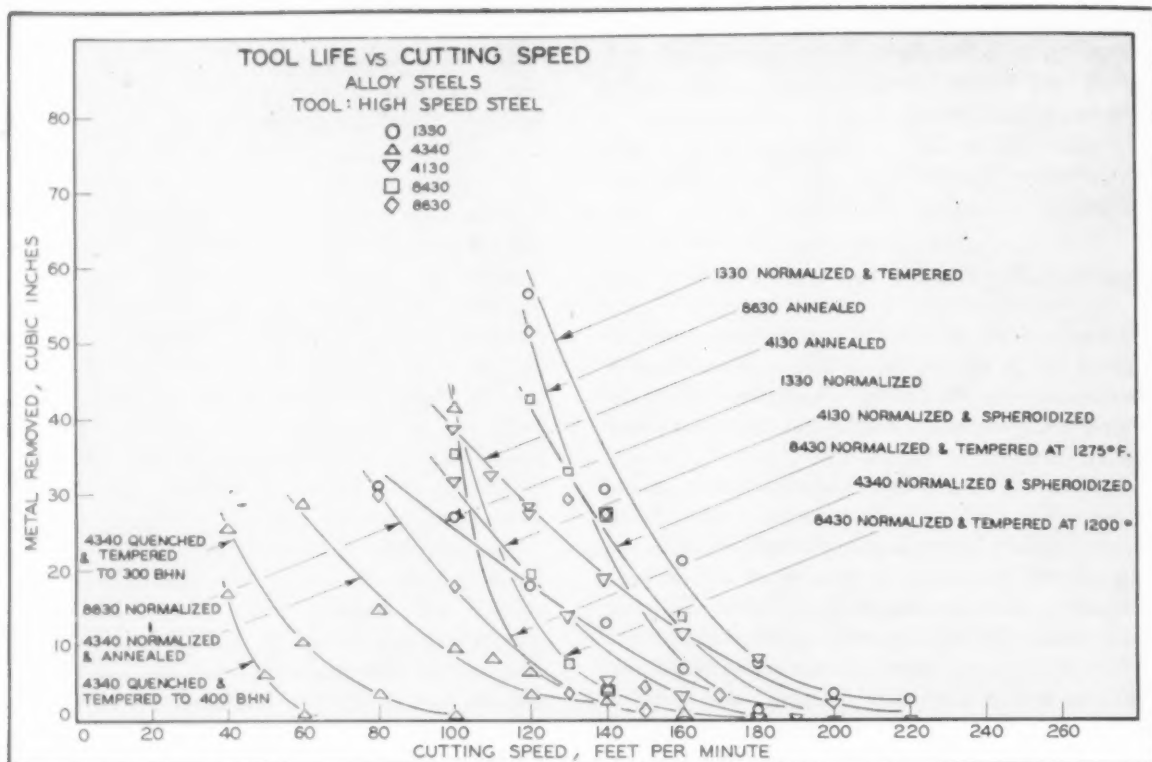


Fig. 4. Tool life vs. cutting speed when machining alloy cast steels with high-speed steel tools.

This difference in machinability was observed although the hardness of the two structures was practically the same, 185 to 190 BHN.

When cut with carbides, the machinability of the four heat-treated forms seems to be proportional to the ratio of ferrite to pearlite in their microstructure. The 60 : 40 ratio machines best; the others follow in the order of their decreasing amounts of ferrite.

With high-speed steel tools the machining properties of the four heat-treated forms correspond closely to the Brinell hardness, the softest form exhibiting the best machining characteristics. However, all of the forms, with the exception of the normalized and quenched one, machine almost alike. The latter should be machined at about 50 percent of the cutting speed of the former.

**Medium Manganese Cast Steel:** The 1330 steel was investigated in two different heat-treated conditions: normalized and tempered, and normalized. The former can be machined with carbides at a speed 125 percent higher than the latter, although there is a hardness difference of only 27 points, 160 to 187 BHN. This steel machines rather poorly in comparison with the others, and it was necessary to test the steel at speeds as low as 150 and 200 fpm in order to obtain practical tool life values. If the high-speed steels are used as the machining tools, then the softer, tempered steel can be machined at a speed 75 percent higher than that for the steel in the normalized condition. At 120 fpm, an increase

in metal removal of 300 percent can be attained through tempering.

**Cr-Mo Cast Steel:** The Cr-Mo steel (4130) was investigated at two heat-treated conditions, annealed, and normalized and spheroidized. They machine practically alike with carbides. Undoubtedly, a longer, more complex spheroidizing cycle, resulting in coarser spheroids, would improve the machining characteristics of this steel; the heat-treating costs, of course, would be increased at the same time.

This condition also holds for high-speed tooling. The annealed steel can be machined at a speed about 10 percent higher than the spheroidized form. Both forms have a hardness value of 175 BHN.

**Ni-Cr-Mo Cast Steel:** The 4340 cast steel was given four separate heat treatments, normalized and annealed, normalized and spheroidized, quenched and tempered to 300 BHN, and quenched and tempered to 400 BHN. The spheroidized form displays the best machining characteristics with carbide tools. This form can be machined at approximately 65 percent greater speed than the annealed steel. The quenched and tempered forms both machine poorly. At very low speeds, 175 to 200 fpm, the two forms machine almost alike, but at higher speeds, the softer steel can be machined more easily. At 300 fpm, an increase in metal removal of 400 percent is obtained through heat treatment.

A spheroidizing cycle produces good machining characteristics; in fact, there is considerable improvement over that shown by the annealing heat

treatment. At the same time, there is a difference of only 10 hardness points between the two forms: the spheroidized steel recorded 210 BHN and the annealed, 200 BHN.

Studies with high-speed steel tools showed that the 4340 steel for the four conditions of heat treatment can be more readily machined in the order of increasing hardness with the exception of the spheroidized steel which machines slightly better than the annealed steel.

Annealed 8630 cast steel (50 percent ferrite—50 percent pearlite) machined considerably better than the normalized (80 percent Widmanstatten) sample. Actually, the former can be machined with carbides at a cutting speed 65 percent greater than for the latter. At 300 fpm, an increase in metal removal of 135 percent can be attained by annealing. The annealed steel (175 BHN) can be machined with high-speed steel tools at a speed 65 percent greater than for the normalized steel (240 BHN).

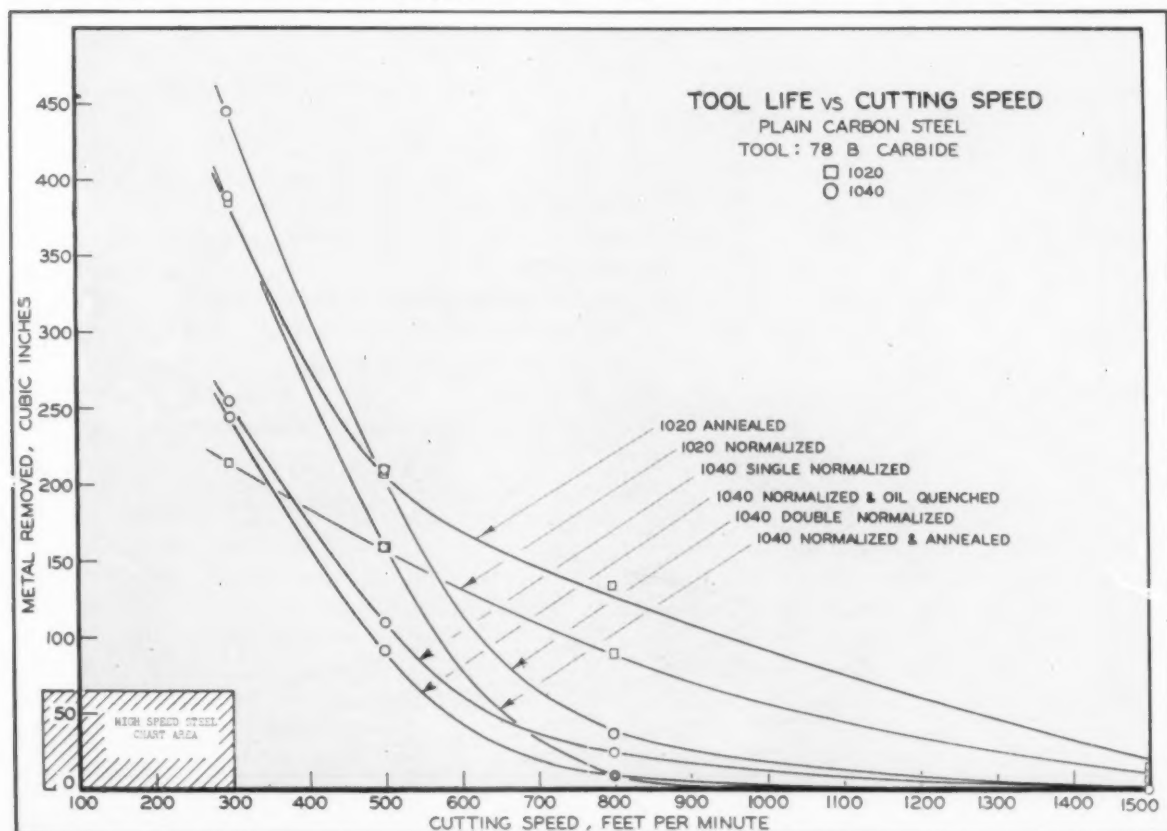
**Mn-Mo Cast Steel:** Two groups of 8430 bars were normalized; however, one group was tempered at 1200 F while the other one was tempered at 1275 F. It is to be noted that the high temperature tempering treatment allows an increase in cutting speed of 25 percent when the steel is processed with carbides. This is an appreciable improvement.

The high temperature annealed form (BHN 180) can be machined with high-speed steel tools at a cutting speed about 35 percent higher than the other form (BHN 200).

**Skin Effect:** Some studies were made on machining the casting skin of the test bars submitted. It is fully realized, of course, that the casting skins machined in these studies represent about the poorest surface conditions to be secured in steel castings. The reasons for this are: (1) A cylindrical bar is a difficult casting to produce since it must be gated at one end and contains only a small riser at the other end. Thus, eroded sand may be found in the surface and small cavities are possible in the metal because the bar could not be fed properly. (2) A number of the steels procured for study were produced as open-hearth steels and the small bars were poured from large bottom pour ladles. Such an unusual method of pouring aggravated the mold erosion problem. (3) The foundries were not permitted to remove visual defects and repair them by welding, as is the commercial practice on surfaces to be machined. (4) The surface contained oxide scale from heat treatment of the bar. Such scale usually has a detrimental effect on machinability and is always removed by pressure blasting prior to machining operations.

Machining tests on the casting skin, therefore,

Fig. 5. Tool life vs. cutting speed when machining carbon cast steels with carbide tools.





constitute the minimum conditions of surface acceptability. Additional tests, of course, should be made so as to correlate the various surface conditions with machinability. In this way an idea of what would be expected of commercial castings would be secured. However, the skin machining studies will give what might be expected under the poorest of surface conditions and for the time being, until further studies are made, the foundryman can assume an intermediate value between the skin and base metal values reported here as the probable conditions for machining the skin of commercial steel castings.

The skin machining studies were made to a depth of  $\frac{1}{4}$  inch from the surface and included the surface. The bars were covered with an oxide scale resulting from heat treatment.

Generally speaking, it would appear that for poor casting surfaces, machining operations should be carried on at approximately one-half the cutting speed recommended for the base metal in order to obtain equivalent tool life. Heat treatment, on the whole, seems to have little effect on the machining characteristics of the skin, as far as the present studies are concerned.

It would seem that perhaps important gains in machining economy in the steel casting industry can be accomplished by providing better surfaces

on steel castings. The studies indicated that of all the skin surface defects, sand inclusions, because of their abrasiveness, are detrimental to tool life. Porosity may cause immediate tool breakage, especially in the case of carbides, and also tends to decrease tool life by causing an intermittent cut.

**Power Requirements:** TABLE 2 gives an indication of machine capacity in terms of horsepower. Power requirements for processing the various steels tested are evaluated as horsepower per cubic inch per minute.

The requirements for the high-speed steel tools were checked in the speed range of 50 to 100 fpm and the carbide tools were checked in the range of 200 to 800 fpm. The feeds per revolution used were in the range of 0.005 to 0.015 inch. It will be noted that the power required by the high-speed steel tools generally follows the Brinell hardness of the cast steel. This is not necessarily true for the carbide tools.

**Machinability Index:** The machinability index is a chart whose function is to show at a glance the relative machining characteristics of steels having various conditions of heat treatment. Index numbers are assigned in a rather arbitrary manner in that they are based on short tests extrapolated to 2 to 3 hours and modified by field experiences

Fig. 6. Tool life vs. cutting speed when machining alloy cast steels with carbide tools.

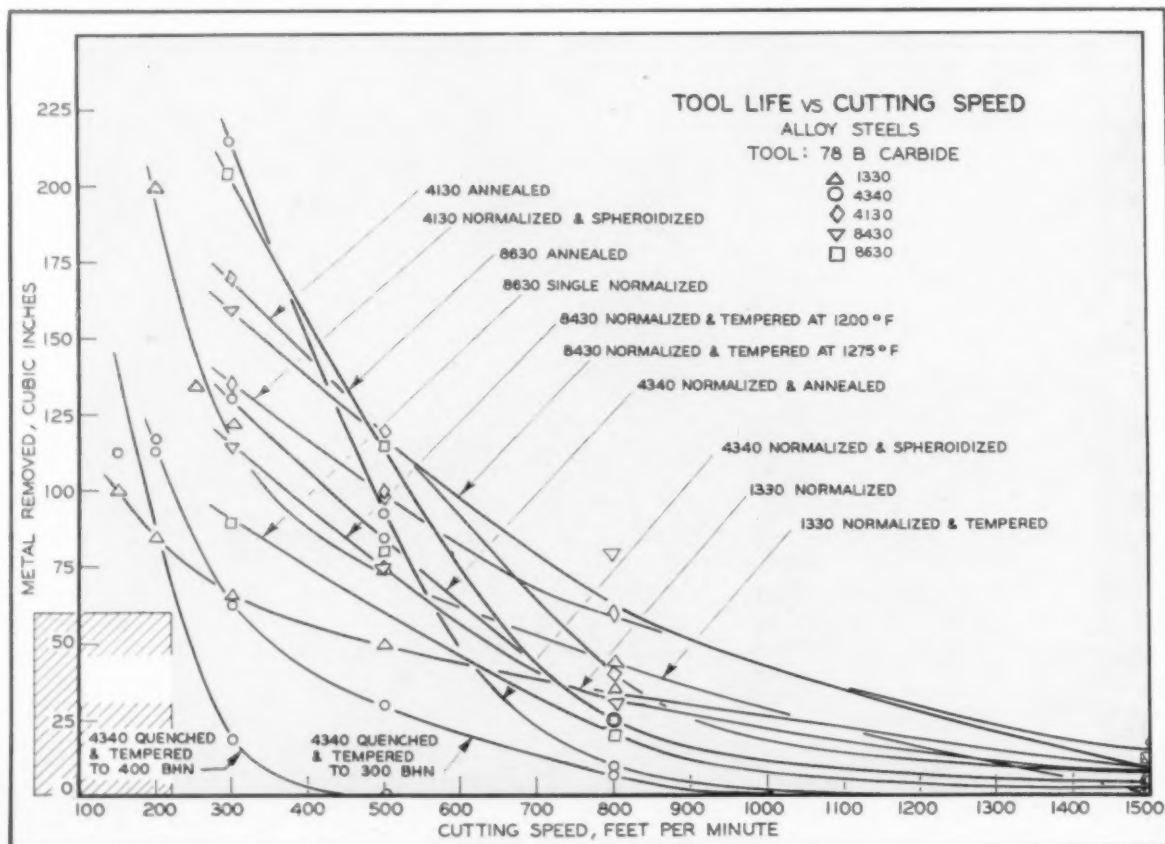


Table 2—Power Requirements

Cast Steel	Speed (fpm)		Structure	BHN	Hp/cu in./min.	
	Carbide	HSS			Carbide 78B	HSS
1020	200-500	50-100	Annealed	122	0.89	0.82
	300-800	50-100	Normalized	134	0.90	0.82
1040	200-500	50-100	Annealed	175	0.77	0.84
	200-500	50-100	Normalized	190	0.74	0.82
	300-500-800	50-100	Double normalized	185	0.87	0.94
	300-800	50-100	Normalized and quenched	225	0.78	0.93
1330	200-500	50-100	Normalized	187	0.83	0.79
	200-500	50-100	Normalized and tempered	160	0.92	0.89
4130	300-800	50-100	Annealed	175	0.82	0.90
	300-800	50-100	Normalized and spheroidized	175	0.86	1.02
4340	200-500	50-100	Annealed	200	0.81	0.87
	300-800	50-100	Normalized and spheroidized	210	0.80	0.93
	200-500	50-100	Quenched and tempered	300	0.87	1.00
	200-500	50-100	Quenched and tempered	400	0.90	1.07
8430	300-800	50-100	Normalized and tempered, 1275 F	180	0.76	0.98
	300-800	50-100	Normalized and tempered, 1200 F	200	0.71	0.88
8630	300-800	50-100	Annealed	175	0.76	0.88
	300-800	50-100	Normalized	240	0.85	0.89

along with considerations involving the type of machining operations. Those responsible for the index numbers admit that they represent only a starting point.

The main drawback to most index systems is that they apply to steel over too wide a hardness range. For example, the range for 4340 steel is 187-241 BHN. Also, an index should actually depend on the microstructure, as well as the hardness, and in some cases may vary  $\pm 25$  percent from the index number.

In a broad sense then, index numbers give general trends in the interpretation of the suitable cutting speeds that should be used in machining (turning). If, however, one is too specific in their use, the results may be meaningless. The relative ratings for machining steels are not necessarily the same for high-speed steel tools and carbide tools.

Index for carbide tools TABLE 3, was prepared to aid in making quick relative comparisons of the machinability of cast steels. The index is based on the amount of metal removed from annealed carbon cast steel (1020) in cubic inches per tool grind, using a carbide tool, machining at a speed of 300 feet per minute. This condition, arbitrarily, was given an index number of 10.

The index may be determined by referring to TABLE 3 under the corresponding steel and heat treatment. If the number obtained is 4, it means that the machining of this particular type and structure of cast steel will be 40 percent of the metal removable per tool grind for the base steel. The base steel, as pointed out, is the carbon (1020) cast steel in the annealed state machined at 300 fpm. If the number is 11, then 10 percent more metal removal per grind can be expected; if the number is 8, 80 percent can be expected; and so on.

The machinability index for high-speed steel tools is not well-known. A standard wrought steel of the free machining type (B1112) machined at 180 sur-

face feet per minute and giving a tool life of 2 to 3 hours has been selected as the reference base.

The test data for cast steels have been studied and index numbers have been assigned as shown in TABLE 4.

#### How to Apply the Data To Practical Machining Operations

The tool life data using carbide tools have been plotted on charts such as shown in Fig. 7. These charts show cubic inches of metal removed (per 0.100-inch depth of cut and feed of 0.010 inch) vs cutting speed. For example, take a turning operation requiring the removal of 5 cubic inches per piece. Assume the steel to be cut is an annealed Ni-Cr-Mo (8630) steel and it is to be cut with a 78B carbide tool, or the equivalent. According to Fig. 7, the metal removed in cubic inches or, therefore, 40 pieces (200/5) may be machined before the total wear reaches 0.015 inch. It must be remembered that this value is based upon Fig. 7 which calls for a 0.100-inch depth of cut.

If a 0.150-inch depth of cut is used, the amount of metal removed at the same cutting speed (300 surface feet per minute) is increased 50 percent to a value of 300 cubic inches instead of 200 cubic inches. Now the number of pieces that can be machined equals 300/5 or 60.

Similarly, at 500 surface feet per minute, Fig. 7, 100 cubic inches will be removed with a 0.100-inch depth of cut. With the 0.150-inch depth of cut the number of pieces at 500 surface feet per minute is again increased by the ratio of depths of cut (0.150/0.100) to a value of 30.

It is assumed that the turning is a roughing operation. In this case size control is not important and therefore it would be impossible to extend the wearland to 0.030 inch instead of 0.015 inch. This will double the number of pieces produced per tool

Table 3—Machinability Index for Cast Steels with Carbide Tools  
(Machining speed 300 sfm)

Cast Steel	Anneal	BHN	Norm.	BHN	Double Norm.	BHN	Norm. & Temp.	BHN	Quench & Temp.	BHN	Norm. & Spher.	BHN
1020	10	122	6	134								
1040	10	175	6	190	11	185			6	225		
1330			2	187			3	160				
4130	4	175									3	175
4340	3	200							2 1/2	300 400	6	210
8430							4	180				
							3	200				
8630	5	175	2	240								

grind and consequently:

Number of pieces equals  $2 \times 60 = 120$  at 300 sfm

Number of pieces equals  $2 \times 30 = 60$  at 500 sfm

The time of cutting at 300 sfm, Fig. 7, equals 55 minutes for 60 pieces or 110 minutes for 120 pieces (0.030-inch wearland). This means approximately 1 minute per piece. If the loading and unloading time per piece is  $1\frac{1}{2}$  minute, then the total time is  $11\frac{1}{2}$  minutes or the total time required for 120 pieces will be 180 minutes. Tools would then need to be changed every three hours.

If the surface feet per minute is 500, then the time of cutting for 100 cubic inches of steel is 15 minutes for 30 pieces as read from the cutting time chart, Fig. 7. Based upon the increased wearland of 0.030 inch, 60 pieces would be machined in 30 minutes before tool sharpening would be necessary. This means a machining time of  $\frac{1}{2}$  minute per piece. If the loading and unloading time is  $1\frac{1}{2}$  minute, then the total time per piece is 1 minute. Sixty pieces can then be machined in 1 hour before a tool change is required. Figures compared at 300 and 500 surface feet per minute show that 120

pieces may be machined as follows:

Speed f/m	Time (120 Pieces/min)	Time Between Tool Changes (min)
300	180	180 (every 120 pieces)
500	120	60 (every 60 pieces)

This comparison points out that, at the higher speed, the production rate is increased approximately 50 percent (120 pieces machined in 120 minutes vs 180 minutes) but tool changes are required three times as frequently (change in 60 minutes vs 180 minutes).

This example shows that, at higher cutting speeds higher production rates are possible; but with the greater speed the tool changes increase. Hence, the tool maintenance cost increases.

**Power Requirements:** It is an advantage to know, when scheduling and planning work for the machine shop, how much power will be required to do a given operation. Estimates of the power required are made as follows:

1. Determine the rate of metal removal in cubic inches per minute. The rate of metal removal is the speed in inches per minute, times the feed in inches per revolution, times the depth of cut in inches.
2. Select the unit power requirement for the material and its heat-treated condition, TABLE 3.
3. Multiply the unit power required by the rate of metal removal. This product gives the horsepower required at the cutting tool for a sharp cutter.
4. Divide power in step 3 by 0.8 to get the power at the motor. The power required at the motor will be greater than the power at the cutter because of the efficiency of the machine. A factor of 0.8 can be used.
5. The power is further increased as the cutter dulls. This power may increase as much as 40 to 50 percent. It is recommended that the power increase for dullness and efficiency be combined into one factor, say approximately 50 percent.

Suppose a tubular shaped steel casting is being machined with high-speed steel tools at 50 surface feet per minute, a feed of 0.015 inch per revolution and a depth of cut of 0.125 inch. The rate of metal removal is  $50 \times 12 \times 0.015 \times 0.125 = 1.125$  cubic inches per minute. The power required can then

Table 4—Machinability Index for Cast Steels with High-Speed Tools  
(Machining speed: 180 sfm with tool life of 2 to 3 hours)

Steel	BHN	Machinability Index Number
B1112 Free machining steel (wrought)	179	100
1020 Annealed	122	90
1020 Normalized	134	75
1040 Double normalized	185	70
1040 Normalized and annealed	175	75
1040 Normalized	190	65
1040 Normalized and oil quenched	225	45
1330 Normalized	187	40
1330 Normalized and tempered	160	65
4130 Annealed	175	55
4130 Normalized and spheroidized	175	50
4340 Normalized and annealed	200	35
4340 Normalized and spheroidized	210	55
4340 Quenched and tempered	300	25
4340 Quenched and tempered	400	20
8430 Normalized and tempered, 1200 F	200	50
8430 Normalized and tempered, 1275 F	180	60
8630 Normalized	240	40
8630 Annealed	175	65



be calculated based upon TABLE 2. The unit power required for normalized 1040 steel is 0.82 or, therefore,  $1.125 \times 0.82 = 0.92$  horsepower. These values are based upon sharp tools. Considering the dulling of the tool and efficiency of the lathe used about 50 percent should be added. This means that the lathe should be equipped with a  $1\frac{1}{2}$ -horsepower motor.

If the job is done with carbide tools at a cutting speed of 300 sfm, the rate of metal removal will be  $300 \times 12 \times 0.015 \times 0.125 = 6.75$  cubic inches per minute. The power required then will be  $6.75 \times 0.74$  or 5 horsepower. The lathe motor required then will be about 50 percent higher or  $7\frac{1}{2}$  horsepower.

### Conclusions

It may reasonably be concluded from the test data that microstructure has a definite effect on the machinability of cast steels. In some cases it is possible to improve machining characteristics as much as 100 to 200 percent through heat treatments, which alter the microstructure.

Some steel foundries may find it profitable to change to heat treatments which result in better tool life. While it may be possible to increase machinability by a structure change, the physical properties required in the final part must not be forgotten. For example, a structure with blocky ferrite and coarse pearlite cannot be expected to give high impact results, particularly at lower temperatures.

Generally speaking, hardness alone cannot be

taken as the criterion for predicting tool life in the cutting of cast steels.

In general, for a given structure, the plain carbon steels possess better machining properties than the alloy steels.

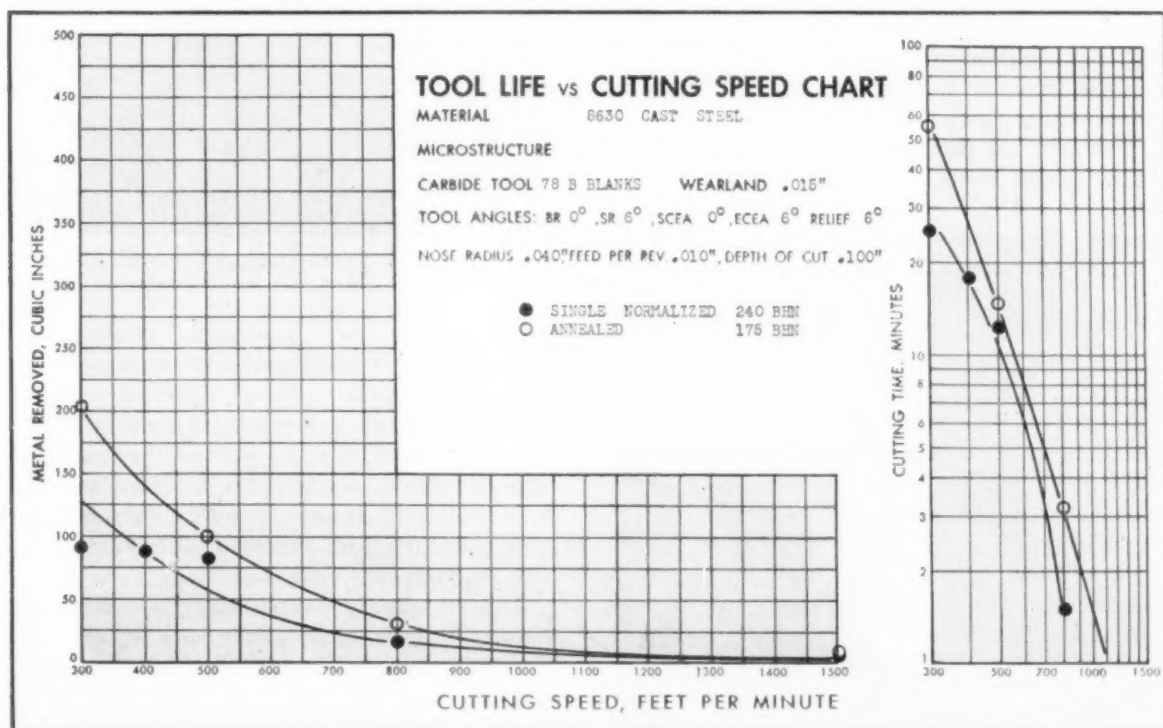
Tool life of carbon (1040) cast steel, when machined with carbides, varies as the ratio of ferrite to pearlite in its microstructure, the 60 : 40 ratio machining best.

The skin of the cast steels tested machined quite poorly. The reason for this was that the test procedure precluded the processing or conditioning of the casting skin for machining operations. The term "skin" is meant to include a peripheral section of bar to  $\frac{1}{4}$  inch underneath the surface. It is possible that the misconceptions concerning the machining characteristics of cast steels have arisen from the fact that most commercial machining is done on the casting skin.

To obtain equivalent tool life, the skin of a cast steel should be machined at approximately one half of the cutting speed recommended for the base metal.

Tentative comparisons were made, on a one-heat basis, of three cast and wrought steels: 41xx, 43xx and 86xx after various heat treatments. The wrought and cast steels of equivalent microstructure machine about alike with high-speed steel tools within the practical speed range. The carbide tool machining results are roughly comparable since most of the cast and wrought steels cross on the tool life vs cutting speed charts.

Fig. 7. Tool life vs. cutting speed chart for Ni-Cr-Mo cast steel, annealed, when machined with carbide tools.



# Improved Plaster Tooling

By John Starr

USING A NEW-TYPE impregnating resin, the economic advantages of plaster casting compositions and the relatively high strength properties of castable plastics are being combined in the fabrication of mockups, patterns, molds, jigs, and fixtures for the aircraft industry.

The resin, known as Plaspreg, prior to use is a moderately dark liquid with only slightly more viscosity than water. It is prepared for use by mixing one part catalyst with five parts resin, by weight or by volume, after which it has a bench life ranging from two hours to several days, depending on the type of catalyst used.

The resin is said to be particularly useful because it will enable unmodified plaster casts to attain better physical properties than could be anticipated in casts comprising the most expensive types of plaster casting materials.

The casts are dehydrated prior to impregnation operations so that the resin will deeply penetrate the plaster pores and polymerize with optimum speed. Then impregnation is accomplished by submerging small tools or parts in the resin for two or three minutes, or by rapidly brushing several coatings of the catalyzed plastic over all surfaces of large tools or parts.

After it is used as an impregnant, the resin will polymerize or thoroughly solidify at room temperature in a day or two. Heat ranging from 100 to 170 deg F will reduce the curing interval to a few hours.

Many types of liquid plastics may serve as impregnants for plaster if they are properly thinned with solvents. However, the solvents alone will deeply penetrate plaster pores and the resinous constituents consequently become nothing more than well-anchored surface coatings which will sometimes obscure fine surface details.

Plaspreg is a low-viscosity resin containing no

volatile solvents, and will not obscure fine surface details because its penetrating action is both prolonged and uniform.

Plaster of Paris castings having no fiber fillers are analogous to good thermosetting plastic casts after they have been properly impregnated with this resin; and, if suitable reinforcements are incorporated in the plaster prior to solidification, im-

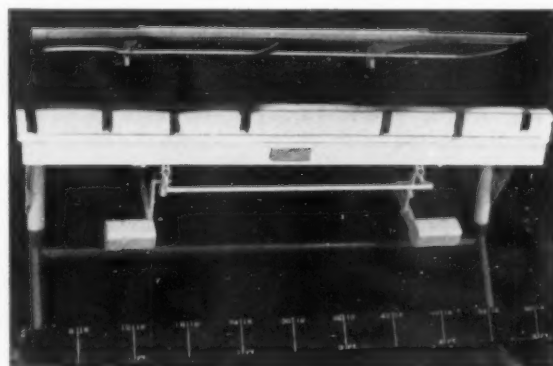


Fig. 1. Router jig, comprising a resin-impregnated plaster contour block and metal structural element.

pregnated tooling casts may have as much impact resistance as a fine grade of wood.

Many of the plaster tools that have thus far been impregnated with Plaspreg were conventional mockups, patterns and molds which would be susceptible to considerable damage in some circumstances if their plaster surfaces were shielded by conventional lacquer or shellac coatings.

This actually reduced tooling costs in most cases because the resin is only a little more expensive than conventional coating materials, and because it was possible to cast and impregnate the least expensive plasters. However, impregnated casts have been



Fig. 2. Welded metal reinforcements for a small stretch die which will be made by casting and resin-impregnating an inexpensive grade of plaster.



Fig. 3. Conventional plaster patterns, bluing blocks, etc. are less susceptible to damage and less expensive when properly impregnated with plastic resins.

utilized most effectively as tools or tooling components which could not heretofore be made with plaster materials.

For example, plaster compounds have been cast with integral metal inserts and reinforcing fibers in low-cost flexible molds so that the aforementioned impregnation techniques would permit use of the resultant castings as form blocks or temporary dies for the stamping of sheet metals by means of the Guerin process.

Similarly, resin-impregnated plaster casts with integral drill bushings, etc., have been satisfactorily used in place of wood and phenolic materials as inexpensive components of drill jigs and trim fixtures in many operations.

Plasters impregnated with Plaspreg normally have dark brownish-black colors which are not objectionable in production tooling. However, special types of the resin can be obtained where light

tan or brown colors are desirable; or finish coatings comprising standard lacquers or enamels can be applied over the impregnated surfaces for virtually any opaque color effect if necessary.

Some difficulties have been encountered where mold-release agents were not removed from plaster casts, since the resin would not uniformly penetrate resultant hard spots. However, experience has proved that difficulties of this type can usually be avoided by lightly rubbing plaster casts with a fine grade of sandpaper.

Where too much heat was used to cure resin-impregnated plaster casts, the latter have had an undesirable tendency to sweat or exude the resin component. This condition has been corrected, without appreciably minimizing the qualities of tooling casts, by using clean rags to remove the sweat and by reducing subsequent curing temperatures to the proper point.

## Two-Ounce Fuse Puller

An ingenious safety product for electricians and maintenance men, this toggle fuse puller, assembled from four molded parts of transparent Tenite, has double the strength of old-style fibre fuse pullers, according to laboratory tests.

It is capable of withstanding over 4,000 volts breakdown after 24 hours immersion in saltwater. One end of the tool handles fuses up to 30 amperes, and the other, fuses from 31 to 100 amperes.

Hinged arrangement of the tool's four component parts insures a non-slip grip during removing or replacing fuses.

The fuse puller, which weighs only two ounces, is made by the Star Fuse Co., Inc., in New York.



# Introducing New Reference Sheets

**W**ITH THIS ISSUE, a new series of Reference Sheets is being inaugurated. Replacing the former Data Sheets, these Reference Sheets will contain information which is selected and tailored to be particularly useful to tool engineers. The data will be correlated from various sources and presented in useful reference form.

Sponsored by the National Standards Committee, this program is planned to cover all phases of production in which tool engineers are interested. Tool angles, feeds, speeds and power requirements for the various types of machining the many materials of today are typical of the subjects that will be included. Also, data on finishes, forming, stamping, extruding and other fields in which ready-reference data are valuable will be covered in the series.

Often useful data, which when presented in chart or tabular form, proves invaluable and saves countless hours of calculations. Such data obtained by engineers in one industry would also be of inestimable help to engineers in other industries. Also, much information that would be useful for the same purpose is available only from widely scattered sources. It will be the purpose of these Reference Sheets to bring together helpful material from both of these types of sources and present it periodically in this series.

Through the extensive contacts of the National Standards Committee which reach into every chapter of the Society, the program will be carefully gaged to meet the needs of the membership. With these facilities a twofold result will be achieved. One, need for information will be analyzed and the data will be developed. Two, data already developed will be correlated and presented in a uniform and useful style. The source of information for each reference sheet will be acknowledged and the applicability of the information, including its limitations, will be listed. It is hoped that these Reference Sheets will not only be useful in easing the burden of regular duties but also stimulate and accelerate standardization programs.



## THE TOOL ENGINEER REFERENCE SHEETS

# Machining Aluminum

ALUMINUM ALLOYS can be machined, generally speaking, at much higher speeds than the heavier metals. Tool form, and sometimes the tool material, must, to a greater extent than with the harder metals, be chosen to suit the actual composition of the alloy to be machined. The side and end relief angles of cutting tools can be of constant magnitude for practically all alloys, but some six or seven top-rake angles are required for best results.

The accompanying tables are from data compiled by the Aluminum Co. Canada, Ltd. Figures given for dimensions and angles of tools are not to be considered as rigid standards; their purpose is to guide the manufacturer in a general way.

Speeds and Feeds for Drilling, Reaming and Tapping

OPERATION	MAXIMUM CUTTING SPEED (fpm)	FEED (Inches per revolution)
DRILLING (Drill press)	With jig — 650 Without jig — 1300	004- 030
DRILLING (Lathe)	1500	004- 016
REAMING (Roughing)	Soft alloys — 200 Hard alloys — 100	010- 035
REAMING (Finishing)	Soft alloys — 400 Hard alloys — 300	003- 010
TAPPING	130	

Speeds and Abrasives for Grinding

	ROUGHING		FINISHING
	Solid Wheel	Cloth Belt	
ABRASIVE	Silicon carbide (SiC)	Aluminum oxide (Al <sub>2</sub> O <sub>3</sub> )	Silicon carbide (SiC)
CARRIER	solid wheel	cloth belt	solid wheel
GRIT	16-100	46-300	30-40
BOND	bakelite	glue	vitrified
HARDNESS	medium		soft
GRINDING SPEED (fpm)	6,000-9,000	3,000①	6,000-7,000

① Maximum

Cuts, Speeds and Feeds for Turning, Shaping, Planing and Milling

OPERATION	TOOL MATERIAL	ALLOY TYPE	ROUGHING			FINISHING		
			MAXIMUM CUT (inches)	CUTTING SPEED (fpm)	FEED	MAXIMUM CUT (Inches)	CUTTING SPEED (fpm)	FEED
TURNING	Carbon steel or high-speed steel	Soft	0.25	700-1,500	0.05 inches/rev. ①	0.04	1,500-3,500	0.004-0.015 inches/rev.
		Hard	0.20	650 ①	0.007-0.02	0.02	600-2,000	0.002-0.01
		High silicon	0.12	400 ①	0.007-0.02	0.02	600 ①	0.002-0.004
	Cemented carbide	Soft	0.25	4,000-7,000	0.012 ①	0.02	6,000-8,000	0.006 ①
		Hard	0.20	500-1,300	0.01 ①	0.02	700-2,500	0.010 ①
		High silicon	0.12	500-1,000	0.008 ①	0.02	500-1,500	0.004 ①
	Diamond	Soft	①	①	①	0.01	Maximum without vibration ②	0.002-0.005
		Hard	①	①	①	0.006	Maximum without vibration ②	0.002-0.004
SHAPING			0.25	Maximum ram speed	0.008-0.031 inches	0.012	Maximum ram speed	0.094-0.156 inches
PLANING			0.37	Maximum table speed	0.020-0.1 inches	0.018	Maximum table speed	0.05-0.375 inches
MILLING	High-speed steel	Soft	0.25	700-2,000	10 feet per minute ① 0.005-0.025 in. per tooth	0.02	5,000 ①	10 feet per minute ① 0.005-0.025 in. per tooth
		Hard	0.25	500-1,500	10 feet per minute ① 0.005-0.025 in. per tooth	0.02	4,000 ①	10 feet per minute ① 0.005-0.025 in. per tooth
	Cemented carbide	Soft	0.3	3,000-15,000	20 feet per minute ① 0.004-0.020 in. per tooth	0.02	3,000-15,000	20 feet per minute ① 0.004-0.020 in. per tooth
		Hard	0.25	3,000-15,000	20 feet per minute ① 0.004-0.020 in. per tooth	0.02	3,000-15,000	20 feet per minute ① 0.004-0.020 in. per tooth

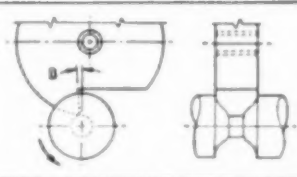
① Maximum

② Diamond tools not used for roughing

③ 500-1,500 fpm

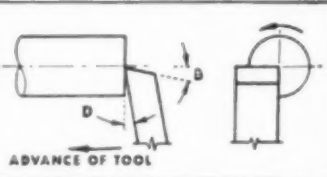
## Tool Angles for Machining Aluminum on Automatic Machines\*

CIRCULAR FORM TOOLS



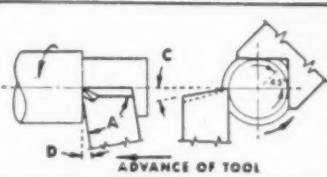
TOOL ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	0 - 3°

FACING TOOLS



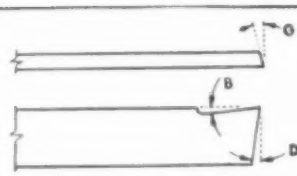
TOOL ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	10 - 15°
Clearance Angle, <b>D</b>	8 - 12°

TURNING TOOLS (Box Tools)



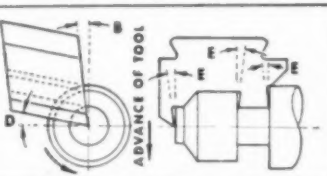
TOOL ELEMENT	TOOL ANGLE
Side Rake, <b>C</b>	0 - 5°
Cutting Angle, <b>A</b>	82°
Clearance Angle, <b>D</b>	8°

CUT-OFF TOOLS



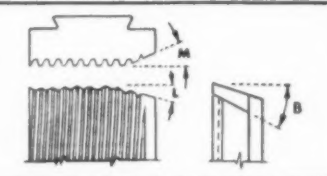
TOOL ELEMENT	TOOL ANGLE
Front Angle, <b>G</b>	8 - 23°
Front Clearance, <b>D</b>	8 - 12°
Top Rake, <b>B</b>	0 - 3°
Side Clearance	0 - 4°

DOVETAIL FORM TOOLS



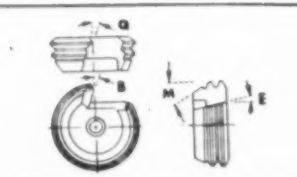
TOOL ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	0 - 3°
Front Clearance, <b>D</b>	10 - 15°
Side Clearance, <b>E</b>	1/2°

TANGENT CHASERS



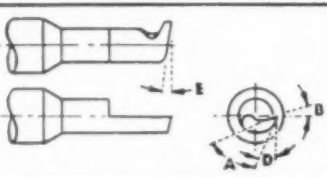
CHASER ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	30°
Chamfer Angle, <b>M</b>	20 - 22°
Lip Hook, <b>L</b>	5 - 10°

CIRCULAR CHASERS



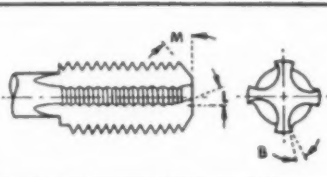
CHASER ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	25°
Chamfer Angle, <b>M</b>	20 - 22°
Face Angle, <b>Q</b>	20 - 25°
Clearance Angle, <b>E</b>	10°

RECESS TOOLS



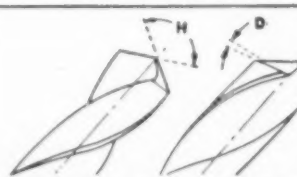
TOOL ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	0 - 5°
Side Clearance, <b>E</b>	1/2 - 5°
Cutting Angle, <b>A</b>	85 - 75°
Front Clearance, <b>D</b>	5 - 10°

TAPS



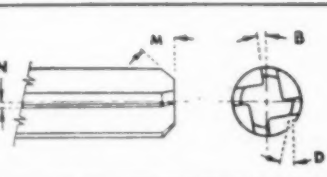
TAP ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	10 - 15°
Chamfer Angle, <b>M</b>	20 - 45°
Lip Hook, <b>L</b>	10 - 15°
Flutes	Polished

DRILLS



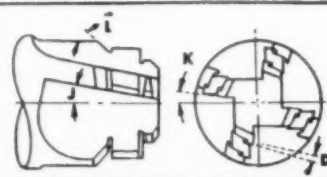
DRILL ELEMENT	TOOL ANGLE
Point Angle, <b>H</b>	118°
Helix Angle	20 - 25°
Clearance Angle, <b>D</b>	12 - 20°
Flutes	Polished
Web Thickness	Thinner than that used for other metals

REAMERS



REAMER ELEMENT	TOOL ANGLE
Top Rake, <b>B</b>	5 - 10°
Clearance Angle, <b>D</b>	10°
Chamfer Angle, <b>M</b>	45°
Flutes	Polished
Land, <b>N</b>	1/64" - 1/16"

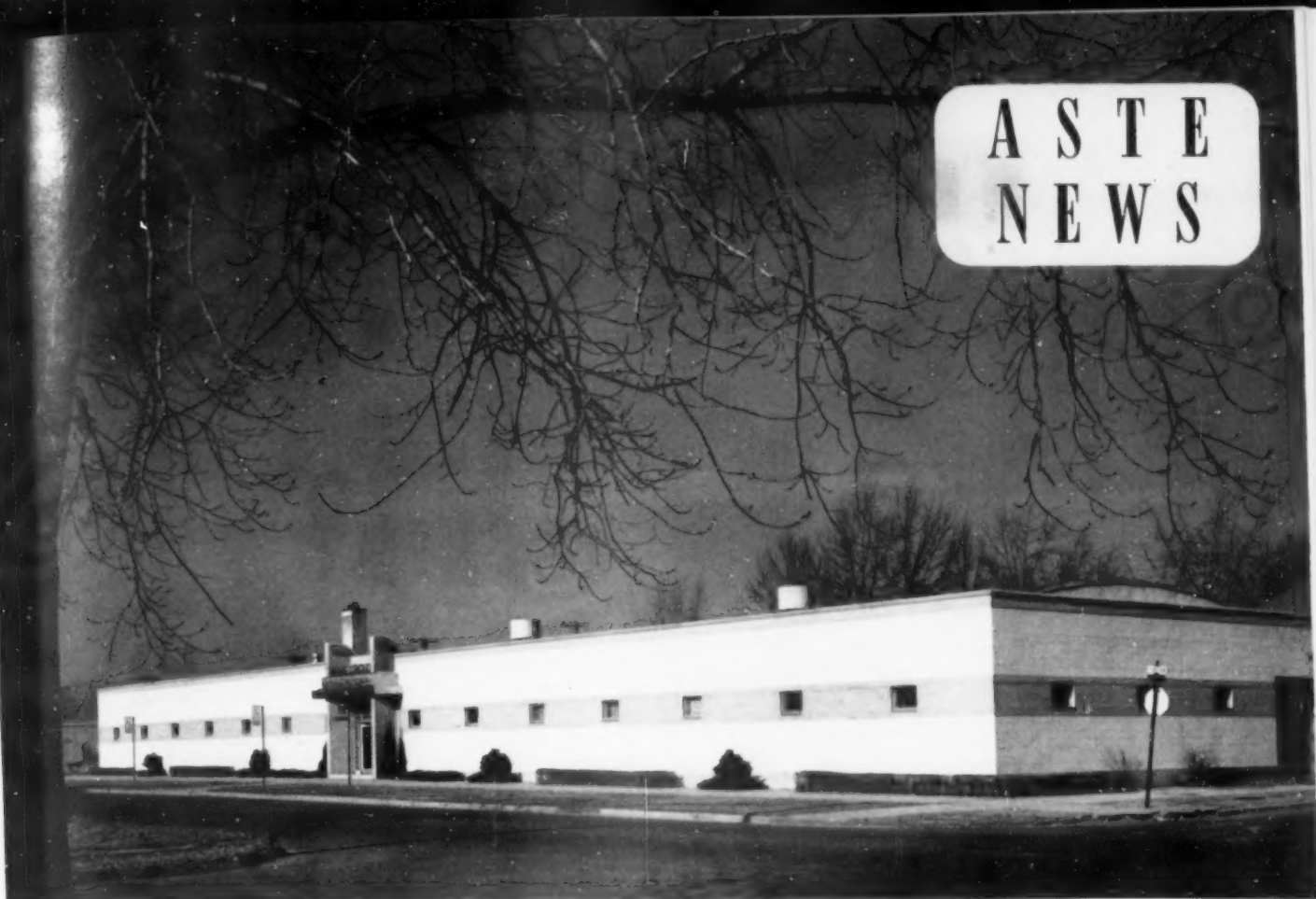
COUNTER BORES



COUNTER BORE ELEMENT	TOOL ANGLE
Longitudinal Rake, <b>J</b>	7 - 10°
Radial Rake, <b>K</b>	5°
Lip Angle, <b>L</b>	59°
Clearance Angle, <b>D</b>	12 - 15°
Land	1/32" - 3/32"

\*Data applies to Alcan 285 which is equivalent to Alcoa 115

# ASTE NEWS



## Wilson Receives ASTE'S Highest Honor

Charles E. Wilson, former president of the General Electric Co. and former director of defense mobilization, was presented with an honorary membership in the American Society of Tool Engineers January 5 at a dinner meeting of the Greater New York chapter held in the New York Times Building.

Mr. Wilson's honorary membership, which is the highest honor the ASTE confers on non-members, was presented to him by National ASTE President L. B. Bellamy for outstanding contribution to the production phases of the U. S. defense effort during his tenure as director of defense mobilization.

In accepting the membership, Wilson became the eighth person to be so honored in the 21-year history of ASTE. Such memberships are conferred by vote of the ASTE House of Delegates with the approval of the Board of Directors.

A similar award has been presented by the ASTE to C. D. Howe, Canadian minister of defense production, for his contribution to the defense effort in that country.

## featured this month...

Coming Meetings .....	87	Golden Gate .....	80
Detroit Host for Society's 1953		Greater Lancaster .....	78
Annual Meeting .....	74	Greater New York .....	87
Engineering Conference		Hamilton Dist. ....	82
Scheduled at Purdue .....	80	Hartford .....	78
First Prepared Program		Indianapolis .....	81
Ready for Chapters .....	85	Kansas City .....	83
J. J. Demuth Honored for		Lima .....	83
Work with NPA .....	81	Little Rhody .....	84
March 1 Deadline for		Long Beach .....	87
ASTE Award Applications .....	79	Long Island .....	82
Obituaries .....	87	Los Alamos .....	78
Positions Available .....	81	Los Angeles .....	81, 85
Situation Wanted .....	86	Mid-Hudson .....	83
Welding Society Sponsoring		Mohawk Valley .....	80
Contest .....	86	Montreal .....	81
West Coast News .....	86	Nashville .....	79
		New Haven .....	85
Atlanta .....	83	Niagara Dist. ....	80
Baltimore .....	81	North Texas .....	84
Chicago .....	80, 82	Portland, Me. ....	79
Cincinnati .....	84	Portland, Ore. ....	84
Cleveland .....	81	Potomac .....	78
Dayton .....	82	Rochester .....	79
Detroit .....	81	Rockford .....	78
Elmira .....	78	Saginaw Valley .....	87
Evansville .....	85	St. Louis .....	83
Fairfield County .....	79	Springfield, Mass. ....	81
Fort Wayne .....	84	Twin States .....	78
		Worcester .....	80

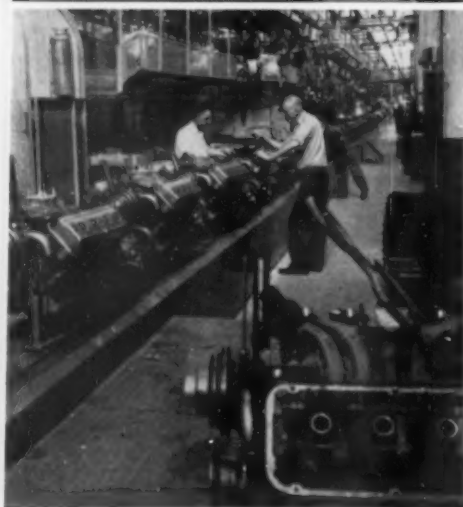


Several sessions of the leadership conference will be held at Rackham Memorial Building, left, which serves as an extension of the University of Michigan and the home of the Engineering Society of Detroit.

# DETROIT ...

## Host for Society's 1953 Annual Meeting

By Nancy L. Morgan



Increased productivity and cost reduction, always vital factors to the man behind the nation's vast civilian and defense production, will keynote the technical sessions at ASTE's 21st Annual Meeting to be held in Detroit from March 17 to 20.

Leading manufacturing experts will present the technical program of 21 papers and three panel discussions. Subjects to be discussed include: "push-button" plants, automatic materials handling equipment, precision finishing processes, production welding, and thread production.

Tours of Detroit industrial plants will be featured on all three days. ASTE members will visit the Plymouth and DeSoto Divisions, Chrysler Corp.; Ternstedt Div., General Motors Corp.; Mechanical Handling Systems, Inc.;

Ford Motor Co.; and Burroughs Adding Machine Co.

Other annual meeting events will feature the election of national officers and directors for 1953-54 annual sessions of the Board of Directors and House of Delegates, meetings of the national committees and the annual membership banquet.

### Follows Leadership Conference

Climaxing an entire week of intense Society activity, the annual meeting follows the two-day leadership conference which opens on March 16 for the newly elected chairmen of ASTE's 102 chapters. The conference, the first such program ever sponsored by a technical society, will be highlighted by the dedication of the Society's national headquarters building.

The Statler Hotel will serve as headquarters for both the annual meeting and the leadership conference. Sessions will also be held at the Sheraton-Cadillac Hotel and at the Rackham Memorial Building, a University of Michigan extension and home of the Engineering Society of Detroit.

Chairmen of the Detroit Host Chapter committees in charge of meeting plans are: Andrew Carnegie, host chair-

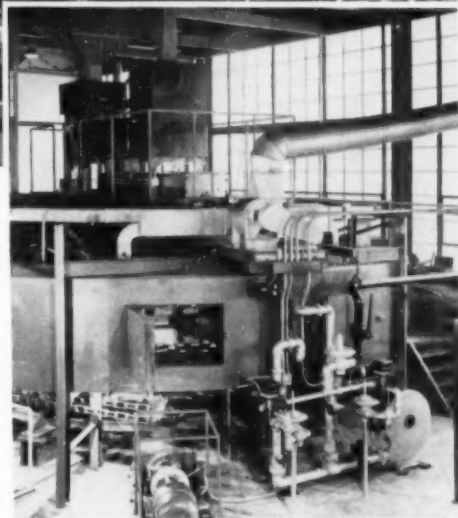
Top photograph: A view of the Statler, headquarters hotel for the annual meeting and leadership conference.

Left: ASTE visitors in Detroit will have opportunity to see De Soto's final assembly line, shown here, where hundreds of carefully machined and inspected parts are assembled into new De Soto Fire Dome V-8 engines.





Above: An aerial view pictures the downtown section of the Motor City. Right: Members touring the plant of Mechanical Handling Systems, Inc., will see the rotary shell molding machine, shown here, see a film on the machine in operation and hear a lecture on the history of shell molding.



man; Ben F. Bregi, technical activities; Frank Estell, social program; and Herman W. Rath, supplementary functions. Arrangements are also being completed by Monta O. Cox, National Program Committee member, and Edward D. Wiard, vice chairman for the event and head of the Detroit ASTE chapter.

Ladies' activities are under the direction of Mrs. Andrew Carnegie. Other phases of the meeting are being handled by: Charles M. Smillie, banquet; John N. Failing, entertainment; and James A. Arnott, reception.

Ralph E. Cross is in charge of plant tours; Frank W. Curtis, technical sessions; Clifton P. Nelson, transportation; John B. Picard, signs; Donald L. Harris, sessions arrangements; Clarence P. Bidle, housing and accommodations; Marvin W. Davis, registration; and Paul F. Rhener, tickets.

Walter S. Patton is handling publicity; Rudolph LaPierre, budgets; Albert L. Caplan, records and reports; and Nicholas Kondur, emergency arrangements.

Chairmen of sister chapters participating in plans for the annual meeting are: Elmer L. Faber, Toledo; Robert J. Maguire, Western Michigan;

David C. Heath, Windsor; Everett R. Keese, Fort Wayne; Clyde L. Fanning, Saginaw Valley; Ronald J. Hayward, Pontiac; David D. Lowber, Waterloo Area; Edwin G. Small, Jackson; and R. J. Schimpf, Lima.

#### Panel on Production Welding

The first panel discussion at the annual meeting will deal with "Problems in Production Welding." Participants will be R. H. Bennowitz, assistant district manager, Linde Air Products Co.; A. F. Boucher, district manager, The Lincoln Electric Co.; and Charles Bruno, chief welding engineer, Products and Applications Dept., Reynolds Metals Co.

Other panel members are: F. E. Kessler, Welding Equipment & Supply Co.; J. F. Randall, supervisor, Welding Development Section, Manufacturing Engineering Office, Ford Motor Co.; and E. J. Zulinski, chief electrical engineer, Progressive Welder Co.

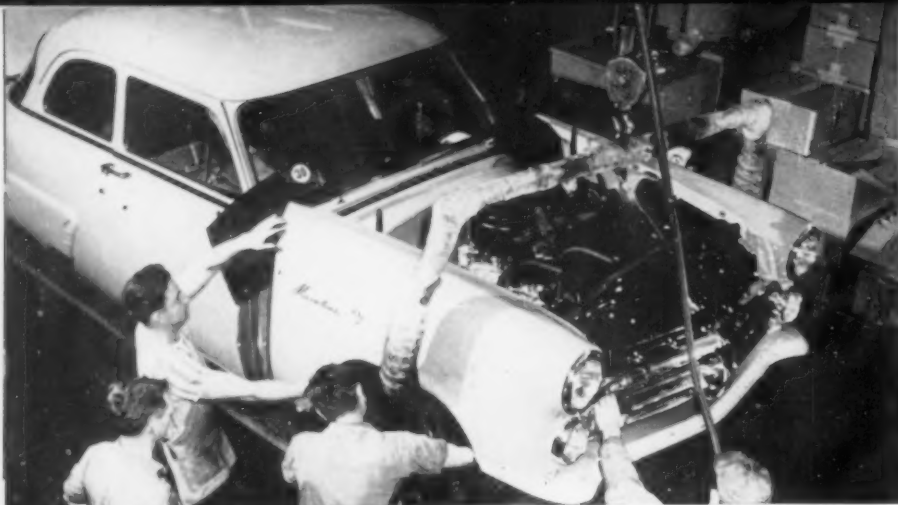
"Problems in Thread Production" will be covered by: Otto Hoelzel, The Eastern Screw Machine Corp.; F. J. Hudson, thread grinding engineer, Ex-Cell-O Corp.; O. E. Koehler, chief engineer, Greenfield Tap & Die Corp.; S. W. Lovejoy, tool supervisor, Small

Apparatus Div., General Electric Co.; A. B. Reed, president, Reed Rolled Thread Die Co.; and a representative of the Hanson-Whitney Co.

Mr. Hoelzel has made outstanding contributions as a thread cutting engineer, including the development of what is now known as dryseal pipe thread. Considered one of the most outstanding authorities on screw thread cutting, he has originated many improvements in die head design and is widely known for his educational work.

With 12 years of practical thread grinding experience, Mr. Hudson will bring to the panel a thorough knowledge of thread production and application of new methods and improvements of thread grinding practice.

Mr. Koehler has a background of more than 45 years in the engineering field. He is a member of five technical



Above: A completed front-end for a Ford sedan is lowered into place on chassis on the final line at the Ford Motor Co. in Dearborn, Mich. This Ford plant is scheduled for two ASTE annual meeting tours.



Left: During the visit to the main plant of Burroughs Adding Machine Co., a leading manufacturer in the office equipment industry, ASTE members will see final assembly of Burroughs portable adding machines.

societies and is serving on several standardization, engineering and research committees involving taps, dies, drills and reamers.

Mr. Lovejoy is the author of several articles published on boring-tool design and application, taps and tapping, mirror finishes on carbides, and cutting control. He holds a degree in electrical engineering from the Massachusetts Institute of Technology.

#### Handbook Author to Speak

Author of the thread rolling section of the *ASTE Tool Engineers Handbook*, Mr. Reed is responsible for the design of the Reed Cylindrical Die Thread Rolling Machine. He has delivered talks for a great number of technical societies, including nearly twenty chapters of ASTE. He is currently conducting an evening school course at Worcester Junior College in management training.

The panel on "Honing, Lapping and Superfinishing" will feature discussions by: R. E. Carroll, manufacturing superintendent, Micrometrical Mfg. Co.; E. F. Katzke, director of Lapping Production Laboratory, Crane Packing Co.; Herman Myer, in charge of super-

finish engineering, Gisholt Machine Co.; D. T. Peden, director of research, Micromatic Hone Corp.; and L. K. Pruett, abrasive technical assistant, Design and Standards Dept., Ford Motor Co.

One of the year's most interesting topics, "Automatic Manufacturing," will be discussed at an ASTE technical session by J. Y. Kaplan, head of the Servo Section, Arma Corp.

Another pertinent subject will be covered by J. B. Carse, industrial products sales manager, S. C. Johnson & Son, Inc., when he speaks on "Use of Wax Base Products in Metal Forming and Machining." Mr. Carse has had years of wide and varied experience in the applications of waxes to industrial use, and was responsible for pioneering waxes designed as lubricants of the metalworking industry. The paper he will present is coauthored by three of Johnson's executives who had major roles in the development and marketing of these interesting products.

Forty-one years of service with Westinghouse Electric Corp. is included in the broad experience of E. E. Griffiths, consulting manufacturing engineer with the Westinghouse headquarters manufacturing division. He will speak to ASTE on "Maintenance Expense Control of Production Tools and Equipment."

Dr. Norman Zlatin, partner, Met-cut Research Associates, will discuss "Structure as an Index to Machina-

bility" at another technical session.

Hard coat surfacing will be covered by L. La Rou, chief engineer, Wall Colmonoy Corp., and F. C. King, assistant superintendent, Speedway Laboratories, Linde Air Products Co. Their specific topics will be "Fusion-Welded Hard Facing" and "Carbide Flame Plating."

#### Lecture on Automatic Sorting

A discussion on "Principles of Automatic Sorting and Feeding" will be presented by J. H. Paquin, tool engineering consultant. His experience includes the development of tooling for jet planes at Republic Aircraft Corp. and tool engineering assignments at United Aircraft Corp., General Motors Corp., Hartford Machine Screw Co. and Underwood Corp.

E. O. Dixon, vice president of research and metallurgy, Ladish Co., will speak on "Dies for Forging High-Temperature Alloys." His experience has covered a wide scope of engineering and metallurgy which is associated with the production of closed and open die forgings, and the various special hot forming operations in connection with parts for aircraft, tractors, oil-well tools and gas turbines.

Ralph E. Cross, executive vice president, The Cross Co., will deliver a paper on "Controlling Machine Down Time." He has designed and developed a number of machines for rounding, chamfering and burring gear teeth. In the field of special design machine tools Mr. Cross is the originator of the Cross Transmatic, a trade name applied to a wide variety of Cross special and transfer type machine tools. He pioneered the development of pre-set tools for high production machines to reduce down time and improve quality.

#### Lengbridge Talk Scheduled

A charter member of the Toronto ASTE chapter, John W. Lengbridge is well known by Society chapters for his technical programs on deep drawing and spinning. His topic in March will be "Evaluation of Spinning vs. Drawing and Forming." Author of a *TOOL ENGINEER* series on drawing aluminum, Mr. Lengbridge has an impressive career of 42 years in the mechanical engineering field.

O. C. Turchan, director of research and development, Turchan Follower Machine Co., will discuss "Equipment and Tooling for Contour Forming." He is a graduate from the German Institute of Technology and holds a fellowship appointment in the physics department of the Graduate School at the University of Detroit.

"Advances in Precision Boring" will be covered by Dr. R. S. Hahn, con-



R. E. Cross



J. H. Gerstenmaier



D. T. Peden



A. B. Reed



Dr. George Sachs



Dr. R. C. Gibbons



S. W. Lovejoy



O. W. Loudenslager



E. O. Dixon



A. G. Denne



O. E. Koehler



E. E. Griffiths



R. L. McWilliams



F. J. Hudson



R. E. Carroll



J. H. Lengbridge



G. C. Lawrie



Otto Hoelzel



J. B. Carse



O. C. Turchan



J. F. Randall



Dr. R. S. Hahn

## Technical Speakers For Annual Meeting

sulting engineer, The Heald Machine Co. A graduate of the University of Cincinnati, his recent work has concerned study of metal-cutting, grinding and vibration problems.

A paper on "Development in Electrolytic Grinding" will be presented by L. H. Metzger, president, Super-Cut, Inc. W. L. Kennicott, chief engineer, Kennametal, Inc., will cover "Tool Engineering Applications of Titanium Carbide Alloys."

"Correlation of Metallurgy with Engineering Design" will be discussed by Dr. R. C. Gibbons, chief metallurgist, Utica Div., Bendix Aviation Corp. A paper on "Manufacturing Applications for Metal Stitching" will be presented

by A. G. Denne, manager, Round Wire Stitching Dept., Acme Steel Co.

A technical session on production uses of adhesive-bonded joints will feature discussions by O. W. Loudenslager, manager of Research and Development Dept., Goodyear Aircraft Corp., and J. H. Gerstenmaier, development manager, Molded and Extruded Goods Plant, Goodyear Tire & Rubber Co. Their specific subjects are: "Metal-to-Metal Bonding" and "Rubber Bonding."

### Production in Europe

A report on tool engineering in Europe will be made by Burnham Finney, editor of *American Machinist*.

Dr. George Sachs, director of metallurgical research, Syracuse University, will present a paper on "Stress Considerations in Contour Forming."

R. L. McWilliams, staff assistant, General Motors Corp., will speak on "Engineering Procedure in Product Designing." A discussion on "Precision Production Balancing" will be presented by G. C. Lawrie, chief engineer, Tinius Olsen Testing Machine Co.

In some instances, technical lectures and panel discussions at the annual meeting will run simultaneously with the scheduled tours of Detroit industrial plants and various sessions of national committees of the Society.





Two of the more than 50 couples who attended the ladies' night program of the Rockford ASTE chapter, from left, were Mr. and Mrs. Kenneth McKnight and Mr. and Mrs. John Price. The party was held December 11.

### Alcoa Engineer Presents ASTE Technical Program

Washington, D.C.—The chief tool engineer at the Edgewater, N.J. plant of the Aluminum Company of America, L. Trautman, was the technical speaker at the December meeting of the Potomac ASTE chapter held at the Hamilton Hotel. He spoke to more than 55 members and guests on the subject "Impact Extrusions."

The discussion was preceded by a turkey dinner and a color film on "Operation Greenhouse" which told the story behind one of the atom-bomb tests.

—E. C. Austin

### Hartford ASTE Members Hold Education Night

Hartford—An open house at the Hartford Regional Technical School was visited December 1 by members of the Hartford ASTE chapter. All departments were opened for informal visits and inspection, including machine shops and technical labs.

Other phases of the education meeting included dinner at the Hartford City Club and a speech made by Dr. Finnis E. Engleman, commissioner of education for the state of Connecticut, on the topic "Connecticut Vocational Schools and Technicians for Our Times."

—John Hand Conard

### Check Sheets Circulated By National Headquarters

Handy, pocket-folder check sheets, prepared by the National Public Relations Committee, were mailed in December to each chapter chairman, first vice chairman and public relations chairman.

Designed to assist officers and committee heads to carry out the vital public relations phase of chapter operation, the sheets provide capsule information on necessary forms of internal and external communication.

### Ladies' Night Party Draws Capacity Crowd

Rockford, Ill.—A great success was scored by the Rockford ASTE chapter on December 11 when it highlighted its activities for the year with the annual ladies' night party. The event, held at the Faust Hotel, was attended by a capacity crowd of 105 couples.

Organ music accompanied the dinner hour which also featured dancing.

A concert was presented by the orchestra and chorus of the Allen-Bradley Co., Milwaukee, Wis.

Arrangements for the excellent program were made by Kenneth McKnight, local sales manager for Allen-Bradley; John Price of Chicago, regional manager; and Walter Fraser, program chairman for the Rockford chapter.

—Kenneth Hull

### Cornell Laboratory Evaluates Russian Planes

Elmira, N.Y.—At a joint meeting with the Society of Automotive Engineers, the Elmira ASTE chapter heard an informative discussion on "Russian versus American Aircraft." Speaker for the program was Ben Marcin of the Cornell Aeronautical Laboratory, Inc., Buffalo, N.Y., an affiliate of Cornell University.

More than 130 members of both societies were present to learn the findings of the laboratory in its evaluation of Russian aircraft.

Authorized by the United States government, the study called for full engineering information, including a discussion of all components and equipment, a complete weight breakdown and loading report, complete photographic coverage of all parts of the airplane, a discussion of possible servicing and maintenance trouble which may be encountered, and a record of all identification tags and serial numbers.

—Raymond Banfield

### Twin States Chapter Welcomes New Members

Windsor, Vt.—New members were welcomed to the Twin States ASTE chapter at the December 10 meeting held at Windsor House. All from the Kingsbury Machine Tool Co., they are Albert F. Anctil, Raymond D. Bannan, Paul E. Brown, Joseph R. Jarest, and Leon E. Loos. The Kingsbury Co. now holds an affiliate membership in ASTE.

"Simplified Drafting" was the topic discussed by the technical speaker, W. L. Healy, supervisor of technical service, Switchgear Plant, General Electric Co. He stressed the fact that outmoded procedures are now being used when draftsmen make elaborate drawings.

A movie produced by Ford Motor Co. entitled "From Iron Ore to Motive Power" was shown. The movie illustrated the entire process of making iron castings.

—Stacey C. Farrell, Maurice E. Blais

### Greater Lancaster Holds First Ladies' Night

The first ladies' night program in the history of the Greater Lancaster ASTE chapter was held December 16 at the Campus House of Franklin and Marshall College. Nearly 80 members and guests were on hand for the special activities.

Featured speaker was Dr. Robert F. Eshleman, dean of Cedar Crest College in Allentown, Pa. His topic for the evening was "Tools for Mid-Century Living."

National ASTE Director Thomas J. Donovan spoke briefly to the audience and presented each lady with a gift. Among the guests on hand for the program was Dean A. G. Breidenstine from Franklin and Marshall College.

—Kenneth R. Berhardt

### Dr. Orndoff Addresses Los Alamos ASTE Chapter

Los Alamos—Dr. John Orndoff of the University of California in Los Alamos was the technical speaker at a recent meeting of the Los Alamos ASTE chapter. About 40 members were present at the Little Theater of the high school for the technical session.

A film on atomic physics presented a historical review of the development of nuclear physics, from the atomic theory of 1890 to present production of atom bombs. The program was of particular interest to tool engineers because of the complex apparatus used by physicists in their experimentation.

—Herman J. Von Steeg





The program for the December meeting of the Portland, Me., chapter was presented by Richard A. Smith, second from left, candidate for election to the ASTE Board of Directors; and Robert L. Gay, far right, area captain for the National Membership Committee. Shown with them are Frank E. Thomes, far left, chapter treasurer; and John J. Green, chapter chairman.

## Membership Procedures Covered by ASTE Visitors

Portland, Me.—Maintaining and increasing chapter membership was discussed at the December 12 meeting of the Portland ASTE chapter held at the Hotel Graymore. The program was presented by Robert L. Gay, area captain with the National Membership Committee, and Richard A. Smith, candidate for election to the ASTE Board of Directors. Both men are members of the ASTE chapter in Hartford.

The technical portion of the meeting was cut down because of the last-minute illness of the speaker. However, his film "Machine Knives in Industry" produced by the Simonds Saw & Steel Co., was available for viewing by the chapter.

—Clifford B. Smith

## Submarine Construction Described by Navy Expert

Bridgeport, Conn.—Guest speaker at the November meeting of the Fairfield County ASTE chapter was Lt. Comdr. T. M. Swain, head of the engineering department, Submarine School, United States Submarine Base, Groton, Conn. The session, attended by 100 persons, was held jointly with the Bridgeport Tool Engineers Association.

In his talk, Comdr. Swain discussed the functions of the different parts of the submarine and covered in some detail the subject of escaping from submerged submarine.

Increased submarine speed has been effected by removing as many protrusions as possible from the underwater craft. Comdr. Swain supplemented the discussion with a number of large plastic models.

Ross W. Foothorap, president of the Special Die Set Co., was master of ceremonies for the evening's program held at the Stratfield Hotel.

—John Bodnar

## Karl Nowak Promoted

Fenwal, Inc., Ashland, Mass., recently announced the promotion of Karl G. Nowak to the position of superintendent in charge of production. Mr. Nowak, who has been active on ASTE committees, has served as treasurer of the Boston chapter and is currently holding the post of second vice chairman.

## ASTE Chapters Visit Stromberg-Carlson Co.

Rochester—A plant tour was conducted December 1 at the Stromberg-Carlson Co. for Rochester ASTE members who were hosts to the Buffalo chapter and a group of Alfred University students interested in forming a student tool engineering organization. About 325 members of ASTE and their guests attended the event.

Dinner was served in the Stromberg-Carlson cafeteria before the visitation got underway. The tour included every department of the plant which manufactures radios, television sets, telephones, and switchboards.

At an executive board session of the Rochester chapter held on November 24, it was decided to increase the number of scholarships to the Rochester Institute of Technology. The chapter will now make two awards to engineering students showing the most ability in the field of tool engineering.

On November 17 members of the executive board visited Alfred University in Alfred, N. Y., where National Program Chairman James O. Horne addressed a student group on the importance and meaning of ASTE. Chairman Charles DeMartin of the Rochester chapter outlined the required technical qualifications for ASTE membership and gave some notes of general information on the functions of the Society.

—Paul Bruno

## March 1 Deadline for ASTE Award Applications

Announcements and applications for the 1953-54 ASTE International Education Awards have been mailed to the various universities and colleges in the United States and Canada approved by the Engineers' Council of Professional Development.

Copies of this material have also been sent to each chapter chairman, first vice chairman and education committee chairman.

Nine awards will be made to students in institutions in the United States and one to a student in Canada. Grants of \$700 a year will be made effective with the school year beginning in the autumn of 1953 and will be paid on a quarter or semester basis. Applications for awards must be received at national headquarters by March 1.

Fourth or fifth year students in tool engineering, mechanical engineering, production engineering, or industrial engineering, who show interest and aptitude in such subjects as metal processing, plant layout, tool design, inspection and quality control, and manufacturing processes, are eligible to enter the competition.

Awards will be made on the basis of information submitted on the application forms (available at the schools of engineering), additional data which the students may care to present, together with the recommendations of a screening committee which may consist of faculty members and the local chapter education committee.

The completed application form, together with the letters of recommendation, should be forwarded in time to arrive not later than March 1, 1953, at: American Society of Tool Engineers, ASTE International Education Awards, 10700 Puritan Ave., Detroit 21, Mich.

Final selection will be made by the National Education Committee, headed by Arthur R. Diamond.

## Nashville Speaker Reviews Wax Lubricants

Nashville—The November dinner meeting of the Nashville ASTE chapter was held at the B & W Cafeteria and featured a discussion by Charles F. Bolden, southeastern representative for the industrial products department of S. C. Johnson and Son, Inc.

Mr. Bolden spoke to the 25 members and guests present on "Wax Lubricants in Metal Working." He showed many applications of the newly developed wax lubricants in the metal industry.

The technical session was introduced by John Gipson, chapter chairman, who conducted the discussion period which followed.

—J. E. Riordan

## Engineering Conference Scheduled at Purdue

At a meeting held December 7 at the Purdue University Extension in Indianapolis, plans were made for a Tool Engineering Conference to be held at Purdue University in Lafayette, Ind., on Saturday, April 18. Representatives of the university and members of ASTE chapters in Indiana took part in the planning session. The tentative conference program calls for tours of the university, technical programs, a luncheon, and an evening banquet.

ASTE's National Education Committee Chairman Arthur R. Diamond was on hand at the meeting to discuss the functions of the Society and how they pertain to education. Acting as chairman of the group was Halsey F. Owen of Purdue.

Others present were: Joe Enright, Leo Feeney, Ted Harding, J. N. Huser, David Mort and Joe Penn, Indianapolis chapter; L. Haverstock, James Kemp, and H. I. Housewerth, South Bend chapter; A. A. Ullman and Paul W. Vierling, Evansville chapter; Everett Keese and D. D. Welbaum, Fort Wayne chapter; and K. E. Glancy and O. D. Lascoe, representing Purdue University.

## Mohawk Valley Chapter Hears E. J. Klonowski

Ilion, N.Y.—About 60 members and guests of the Mohawk Valley ASTE chapter met November 25 at the Black and White Restaurant to hear Edmund J. Klonowski, sales manager, Punch Div., Pivot Punch & Die Corp., North Tonawanda, N.Y.

Mr. Klonowski spoke on "Pivot Punches—Their Use and Application." He told how the use of standardized, straight ground, shock absorbing punches puts new value on press time by reducing maintenance and replacement, and practically eliminating problems of stock pickup and vibration breakage. —Raymond B. Hurley



Clearing Machine Corp., Chicago press manufacturer, recently held an open house for members of the Chicago ASTE chapter. Conducted through the plant in small groups, the visitors were shown the manufacturing methods and facilities needed to produce the mechanical and hydraulic presses that supply the assembly lines of industry.

## Stainless Steel Applications Outlined

Welland, Ont.—J. L. Cotsworth of the Atlas Steel Co. of Welland was the guest speaker at the December 4 meeting of the Niagara District chapter. His topic for the evening concerned the history and applications of stainless steel.

About 60 members and guests were present at the Barclay Hotel for the meeting. Presiding officer was John Marchyn.

Chief credit for the development of stainless was given by Mr. Cotsworth to the engineers who designed the equipment and to the manufacturers of tool steel who made it possible to build these machines.

Hosts for the evening's technical program were Conroy Mfg. Co. and Engineering Tool & Forgings, both of St. Catharines. —William A. Yaeger

## Golden Gate Party Draws Record Attendance

Oakland, Calif.—Technical speakers were abandoned by the Golden Gate ASTE chapter December 5 and a program in a lighter vein took the spotlight at the annual stag party held at the Moose Club. About 675 members and guests were present for the event and established a new attendance record for the year.

First Vice Chairman Dave Gustafson carried out the chairman's duties for Ted Rohrer who was unable to attend because of a recent eye operation.

Among those contributing to the success of the party were Dean Rouland, program chairman; Ray Reed, treasurer; Phil Freeman, tickets; Hans Metz, in charge of seating arrangements; Paul Pick, production manager; and Ted Lindquist, refreshments.

—Ted Lindquist

## Worcester Party Highlights Holidays

Worcester—The annual ladies' night and Christmas party was held by the Worcester chapter on December 2 at Putnam and Thurston's Restaurant. Guests seated at the head table were introduced by Chairman E. Roland Ljungquist who opened the evening's activities.

After dinner the 130 members and guests present were entertained by Samuel H. Ramsay, humorist and master of ceremonies for the program. Other entertainment was provided by the Diarine Sisters who presented a selection of songs and acrobatic dancing acts. A large number of gifts were distributed to the audience. Music for the evening was furnished by Lynn and his orchestra.

The entertainment committee, headed by Harold L. Jones, arranged the entire program. Assisting were John Rotchford and J. Irving England. Table decorations were arranged by Mrs. Carroll L. Morse. —Harold F. Thompson

Seated at the head table for the ladies' night and Christmas party program of the Worcester ASTE chapter, from left, were: Mr. and Mrs. Carroll L. Morse; Mr. and Mrs. Harry D. Orr; Mr. and Mrs. Harold L. Jones; Joseph P. Crosby, ASTE second vice president; Mrs.

John E. Rotchford and Mr. Rotchford; Mrs. E. Roland Ljungquist and Mr. Ljungquist; Samuel H. Ramsay, Mr. and Mrs. Louis J. Furman; Mrs. Ralph Baker and Mr. Baker; and Adam T. Kosciuszko. The annual event was attended by 130 chapter members and their guests.



## Coffee Talk Highlights Cleveland ASTE Program

Cleveland—A lively talk on baseball experiences with the Cleveland Indians was made at the November meeting of the Cleveland ASTE chapter by Jack Cresson, public announcer for the ball club. His coffee talk was enjoyed by more than 150 members present for the meeting at the Carter Hotel. A short quiz staged by Mr. Cresson netted prizes for Charles Kotersall, Frank Jenkinson and Walter Gusik.

Chairman Andy Clark called the meeting to order and turned over the proceedings to G. W. Carlton, first vice chairman, who conducted the election of the nominating committee. Selecting the candidates for the forthcoming chapter election are Glenn Hier, R. C. Southwell and Dr. Harry B. Osborn, Jr.

The technical speaker of the evening was Frank Zagar, general manager, Zagar Tool Co. His topic was "Jig Design and Operational Technique."

—J. C. Woytek

## Detroit Carbide Program Attracts 125 Members

Detroit—Participants at the December carbide meeting of the Detroit ASTE chapter heard technical talks delivered by 'Butch' Miller of Buick Div., General Motors Corp., and Paul Miller of Carboloy Dept., General Electric Co. Some 125 members and their friends attended the session.

The first speech highlighted the contents of the new General Motors chart of grade characteristics, while the other lecture featured the ways to take advantage of the physical properties of carbids. Questions and answers followed in a lively discussion period.

—Walter Schober

## GE Engineer Addresses Montreal ASTE Chapter

Montreal—Guest speaker at the December 11 meeting of the Montreal chapter was A. L. Munro, application engineer, Canadian General Electric Co., Toronto, who spoke to 80 persons on the topic, "Electronics in Modern Machine Tools." The session was held at Montreal Technical School.

Mr. Munro told how electronic control gives better finishes when grinding, emphasizing the greater control of machine tools and the shortened working time. A film was shown to illustrate the wide range of uses of electronics in industry.

—Frank Winkworth

## Positions Available

### TOOL AND MACHINE DESIGNERS

—One of Cincinnati's largest permanent design firms has openings in their own office for experienced machine, product and tool designers, and detailers.

Recent engineering graduates or students will also be given consideration. These are permanent positions with a substantial, stable leader in the field. We can offer top starting wages, modern working conditions, paid holidays, vacations, and other benefits. Our policies assure varied experience and unusual opportunities with a future.

New employees would be expected to settle on a permanent basis in Cincinnati. Please send resume to Cincinnati Designing, Inc., 37 W. Seventh St., Cincinnati 2, Ohio.

## Radio Personality Entertains ASTE Chapter

Santa Monica, Calif.—Four hundred and one members and guests of the Los Angeles chapter were on hand for the Christmas party held December 19 at the Deauville Club, establishing a new attendance record.

A fine dinner was served and excellent dance music was furnished by Ivan Scott and his orchestra.

Del Sharbutt, master of ceremonies on Bob Crosby's "Club 15" radio program, acted as emcee. Four top acts of entertainment were presented with the enjoyable performance of songs and stories by Mr. Sharbutt. Dancing until 1:30 a. m. rounded out the program.

—Ralph Chrissie

## Party Brings Out 90 Indianapolis Couples

Indianapolis—With the Sahara Grotto dining room as a background, the ladies' night dinner dance held December 4 by the ASTE chapter in Indianapolis was enjoyed by nearly 90 couples. Three local television favorites, "The Haymakers," strolled among the tables during the dinner hour. The entertainers gave a half-hour program before the dancing began.

A short talk on the tool engineering conference scheduled for April 19 at Purdue University was presented by Joe Enright, second vice chairman of the chapter. He also announced the ladies' program.

The Haymakers were joined by four additional musicians and the entire group played for dancing until midnight. Corsages were presented to the ladies by the chapter.

—Richard Garber

## J. J. Demuth Honored For Work with NPA

J. J. Demuth, past president of the American Society of Tool Engineers, has been presented a testimonial award by the National Tool & Die Manufacturers Association for his outstanding work in Washington with the National Production Authority. The tribute was signed by R. H. Cope, president, and George S. Eaton, executive secretary of the association.

It read: "This tribute is offered by the membership of the National Tool & Die Manufacturers Association in recognition of the splendid service you rendered to your country at considerable personal sacrifice as Chief of the Tool, Die, Jig and Fixture Section in the Metalworking Equipment Division of the National Production Authority; and with warm appreciation of the assistance you gave so freely and graciously to those in the industry who requested your help."

## Film Highlights Springfield Session

Springfield, Mass.—A talk on drop forging was featured at the December 8 meeting of the Springfield ASTE chapter. The technical session was held at Springfield Turnverein, with Al Todd acting as technical chairman.

A highlight of the presentation by J. Robert Douslin, general superintendent, Grafton plant, Wyman-Gordon Co., Worcester, was a film on the 18,000-ton forging press in operation at the Grafton plant. It was the second United States showing of the movie.

Another film titled "Glidden Tours" pictured some of the country's most famous antique cars. Coffee and doughnuts were served after the session.

—E. M. Stark

## Baltimore Chapter Holds Ladies' Program

Baltimore—Seventy couples were on hand at the Engineers Club December 3 when the Baltimore ASTE chapter held its ladies' night activities.

A social hour launched the program at 7 p. m. followed by a fine roast beef dinner. A brief history on the growth of the National Enameling & Stamping Co. was delivered by Charles Frahm of Nesco, Inc.

The program was then turned over to National Director Thomas J. Donovan, Jr., who acted as master of ceremonies for the evening. He also conducted a quiz show for the ladies and presented each one with a carved wooden figurine.

—LeRoy L. Rubright



## Long Island Members Hear Plastic Discussion

Garden City, N. Y.—“Plastics in Tooling” was the subject selected by Lawrence Wittman, vice president, Cordo Molding Products, Inc., when he spoke before members of the Long Island ASTE chapter. His talk was made for nearly 100 members and guests who met December 8 at the Garden City Hotel.

Mr. Wittman presented a short history of the early tools used, progressing to modern types of material and tools suitable for each type. Samples of actual tools, slides showing them in use and slides of comparable steel tooling with cost comparisons illustrated his discussion.

The question and answer period which concluded the technical session proved the subject matter to be of keen interest to the chapter.

Guests at the meeting included six manufacturers of plastic who attended at the invitation of Herbert Murphy, chairman of the public relations committee. The award of a copy of the *Tool Engineers Handbook*, donated by Don L. Griffing, chairman of the reception committee, was made to Anthony Grillo of the Morey Machinery Co.

—Sara T. Moxley

## Dayton Party Attracts 220 Members and Guests

Dayton — Miami Valley Golf Club furnished the setting on December 20 for the annual Christmas party of the Dayton ASTE chapter. Some 220 members and their guests enjoyed the social event.

A reception at 6:30 launched the evening's activities, followed by an excellent dinner and dancing until midnight. Party arrangements were made by Roy Dusseau, entertainment chairman, and his committee.

—W. J. Killinger



A program on plastics was presented December 8 for the Long Island ASTE chapter by Lawrence Wittman, right, president, Cordo Molding Products, Inc. Shown with Mr. Whitman is Edward Simonsen, shop foreman for the firm, demonstrating a molded laminated tool.

## Hamilton ASTE Chapter Awards Two Scholarships

Hamilton, Ont.—Five new members of the Hamilton District ASTE chapter received membership pins at the December meeting held at Fischer's Hotel. The presentation was made by William Shaw, chairman, who also announced that the chapter has awarded two scholarships to students at two technical schools, one in Hamilton and one in Brantford.

The featured speaker, introduced by Clarence Bulmer, was the Rev. Cullum Thompson of Dundas who spoke on the United Nations. He urged everyone to take an active interest in the activities of the UN to help in the achievement of the high aims for the benefit of all mankind. A question and answer period concluded the meeting.

—John Litwin

## W. R. Frazer Addresses Chicago Chapter Meeting

Chicago—"The two most important factors in a cutting tool are its toughness and its ability to resist wear," W. R. Frazer told members of the Chicago ASTE chapter at a meeting held December 1 at the Keyman's Club. Chief metallurgist at Union Twist Drill Co., Athol, Mass., Mr. Frazer is also chairman of the Northern Massachusetts chapter of ASTE.

Covering the recent developments in cutting tools, Mr. Frazer said that steels with an ultimate strength of 250,000 psi and a Rockwell hardness of C50-52 are now being machined. Cobalt is the most important element affecting hot hardness which is related to room temperature. The carbide size and its distribution affect the toughness. The carbon content can be increased as the vanadium content increases. This increases the hardenability of the steel.

The grain size has a pronounced effect on the toughness. It is desirable to have the finest grain size with the lowest possible hardening temperature. Vanadium helps resist grain growth.

Carbide tipped drills for drilling cast iron were shown. The drills were not recommended by Mr. Frazer for steel. It is possible to get ten times the number of holes per grind in cast iron at the same speed and feed as used for high-speed steel. Blued drills were recommended for ferrous materials and bright drills for nonferrous materials.

The technical program was attended by more than 150 members and their guests.

—A. L. Winkler

## Named Sales Director

E. Payson Blanchard has been named director of sales in charge of the New Domestic Machinery Div., Morey Machinery Co., Inc., New York, N.Y. He is a member of the Fairfield County ASTE chapter.

The Rev. Cullum Thompson, standing, was the featured speaker at the December 12 meeting of the Hamilton District ASTE chapter. Others seated at the head table, from left, were: Harry Ward, secretary; Gordon Hall; Clarence Bulmer, first vice chairman; William Shaw,

chapter chairman; Mr. Thompson; John Snyder, second vice chairman (partially hidden); William Alexander, George Churchill; Jack Yorick and Frank Johnson, third vice chairman. The dinner meeting and program were held on December 12 at Fischer's Hotel.





## "How About the Inch?" Discussed by Harrington

Atlanta—Meeting with members of ASM, the Atlanta ASTE chapter heard a talk made at the December technical session by John Harrington, chief engineer, Do-All Co., Des Plaines, Ill. The question under discussion was "How About the Inch?"

Mr. Harrington covered the evolution of measuring units, emphasizing the importance of modern measuring standards. He also discussed the relationship between uniform measuring standards and the mass production of interchangeable parts.

Mathematical examples and actual demonstrations were presented to show the feasibility of using the lengths of monochromatic light waves as the measuring yardstick. A considerable amount of effort was made to show that light waves are the only units known to man that do not vary in length.

Also presented at the meeting was a display of the first set of gage blocks made in America. The program was held at the Atlantic Steel Co. and attended by 60 persons.

—Joe L. Morris

## C. K. Swartz Addresses Mid-Hudson ASTE Meeting

Poughkeepsie, N.Y.—"Molds and Their Associated Plastics" was the title of the technical lecture given at the December meeting of the Mid-Hudson ASTE chapter. Nearly 100 members and their guests heard C. K. Swartz, manager of the Development Div., Consolidated Molded Product Corp.

Prior to the talk, Hayden Johnson, Poughkeepsie city manager, explained briefly the organization of the various city departments. During the business session, a committee composed of Edward M. Phalen as chairman, J. Harry Keller, and Frank N. Plotnik was elected to nominate the chapter officers for the coming year.

In his discussion Mr. Swartz described the many factors to consider in designing molds for producing plastic parts, such as type of plastic material, whether operations such as drilling and tapping are to be incorporated in the mold or performed in a subsequent machining operation and so on. He pointed out that molds which provide for a minimum of subsequent machining operations are more expensive to build and consequently are generally warranted only where high production is involved.

Mr. Swartz detailed the various types of molds and molding processes and also related the methods of mold machining.

—S. P. Cook



W. E. Waters, left, awards an electric drill to G. E. Gaffney at the ladies' night meeting of the Lima chapter held on December 9.

## Ladies' Night Held by ASTE Chapter of Lima

Lima, Ohio—A holiday party stole the spotlight from technical programs at the December 9 gathering of the Lima ASTE chapter. The event also served as the ladies' night meeting of the chapter.

Activities at the American Legion were opened with a dinner and included a full schedule of entertainment. Accordion solos were played by Tommy Epley, son of the W. E. Epleys. Vocalist Marjorie Reese of Elida, Ohio, sang several numbers and a magician furnished slight-of-hand tricks to puzzle the audience.

A generous number of prizes were given later in the evening. Dancing completed the agenda.

—W. E. Waters

## Engineer Addresses St. Louis Members

St. Louis—Warren Pouyer, chairman of the St. Louis ASTE membership committee, introduced nine new members of the chapter at the December meeting held at the DeSoto Hotel. More than 250 persons were present for the technical session and dinner which preceded it.

John W. Edgemon, Jr., chief engineer, Magna Engineering Corp., Menlo Park, Calif., presented the technical program on "A New Concept of Production Drilling." His discussion brought out the need for a drill press design which would cut costs by multiple drilling. Slides were used to illustrate the design of the new drill press, such as a new type of power feed mechanism, gear belt drive, and a wide range of application.

A long question and answer period concluded the technical session. The speaker was introduced by Willis Pott-hoff, first vice chairman. Chairman E. P. Huchzermeier conducted the meeting and the election of a nominating committee.

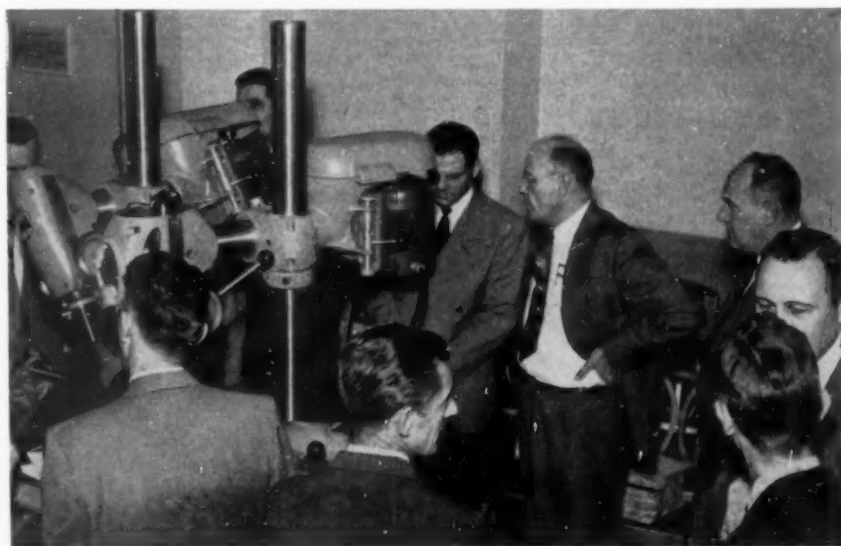
—Harold Bachman

## Kansas City Lecturer Talks on Wax Lubricants

Kansas City, Mo.—"Wax Comes to the Metal Shop" was the topic presented by William H. Kilpatrick, Jr. before 60 members of the Kansas City ASTE chapter at their December meeting. Mr. Kilpatrick is a representative for S. C. Johnson and Son. The dinner and technical session were held at Roselli's Restaurant.

—Logan Childers

An active question and answer period, pictured here, followed the talk made to the St. Louis ASTE chapter by John W. Edgemon, Jr., chief engineer, Magna Engineering Corp., Menlo Park, Calif. His topic for the evening was "A New Concept of Production Drilling." More than 250 persons attended the technical session and dinner held at the DeSoto Hotel.



## Polidor Addresses Cincinnati Chapter

Cincinnati—Activities at the December meeting of the Cincinnati ASTE chapter opened with a dinner served at the Engineering Society headquarters. The coffee program, color film on small game hunting, was followed with a short business session.

Technical speaker for the evening was Edward C. Polidor, chief engineer, Optical Gaging Products, Inc. He covered his topic, "Gaging by Optical Methods," by reviewing its brief history, citing reasons why gaging by optical projection is so important during emergency production, and explaining various types of projectors and typical gaging techniques.

The use of optical projectors for gaging was introduced in the United States about eight years ago and immediately became popular with prime contractors because inspection personnel could be easily trained, and revisions in design could be rapidly and inexpensively made in gaging equipment.

Mr. Polidor used slides to clarify points in his talk. A fifteen-minute movie reviewed the important features of the discussion.

—Louis H. Schumann

## Roger Gay Re-elected Standards President

Roger E. Gay, a member of the ASTE Research Fund Committee, was re-elected president of the American Standards Association at the organization's annual meeting. Mr. Gay has been on the board of directors of ASA since 1946 and is the tenth president of the association.

American Can Company's Portland plant was visited recently by nearly 100 members of the Portland, Ore., ASTE chapter. They toured the new paper container division, with an initial capacity of up to 200 million units annually for the dairy industry, and the 31-year-old metal can division which recently produced its ten billionth can. Plant Manager Stanley J. Hartman, at right of paper container machine, guided a group which included Prof. Milton C. Sheely, left; Daniel J. Melody, chapter chairman; and Gerald E. Healy, past chairman of the Portland chapter.



Guest speaker at Cincinnati's December ASTE meeting was Edward C. Polidor, center, chief engineer, Optical Gaging Products, Inc. Pictured with him are Richard B. Niebusch, left, first vice chairman, and Joseph Aprile, chairman. The meeting was held at the Cincinnati Engineering Society.

## North Texas Members Hear Jess Daugherty

Dallas—Jess Daugherty, consultant with Giddings and Lewis Hypro Products, Fond du Lac, Wis., presented the December program at the Engineers Club for members of the North Texas ASTE chapter. The subject of his talk was "Hypro Aircraft Skin Milling" and concerned integrally ribbed aircraft skins.

A large attendance of 100 members and guests was present for the dinner and technical session.

On November 14 Dr. Stewart Fletcher, chief metallurgist of Latrobe Steel Co., Latrobe, Pa., was the featured speaker and gave a talk on high-speed steels and their application in modern machining methods. The meeting was held at the Worth Hotel in Fort Worth.

—C. V. Stevens

## Little Rhody Chapter Holds Annual Party

Cranston, R. I.—A holiday program of entertainment was featured at the annual Christmas party staged in December by the Little Rhody ASTE chapter. Nearly 200 members and their wives attended the dinner-dance held at Vilmaray Restaurant.

Music was furnished by Happy Stanley and his orchestra. Prizes were awarded to all those present.

—Guido De Angelis

## Dale Burke Talks on Increasing Membership

Fort Wayne—A nominating committee was selected at the December 10 meeting of the Fort Wayne ASTE chapter. Appointed by Chairman Everett Keese to serve with the group were Ralph J. Didier, Milton H. Kline and John G. Astrom.

Two other members were appointed to represent ASTE in the events connected with Engineers' Week in Fort Wayne February 22-29. John F. Davis and Charles A. Haugk were named to the committee.

Among the guests attending the meeting was Dale R. Burke of the National Membership Committee who gave a talk to inspire more work in increasing chapter membership.

Featured speaker for the evening was Charles Kelly, vice president of the Lincoln National Bank and a member of the Board of Aviation at Baer Field in Fort Wayne. He gave a summary of administration problems connected with the operation of the field.

R. K. Rourke of Trans World Airlines, Inc., who was to have spoken at the meeting, forwarded two films for showing at the technical session.

—Eugene T. O'Keefe

## H. L. Stewart Presents His 38th ASTE Program

Evansville, Ind.—Principal speaker at the November meeting of the Evansville chapter was Harry L. Stewart who discussed "Fluid Power in Action." The technical session was held at the Hadi Shrine Temple. It was his 38th appearance before an ASTE audience.

Mr. Stewart outlined the components, circuit problems and applications of air and hydraulics in relation to industrial equipment. He pointed out the vast number of uses that have been found for this medium of power. The various points were illustrated by about 50 colored slides.

The coffee talk was made by Herbert R. Henderson who discussed "Football, Past and Present." His qualifications to speak on that topic include playing half-back for Ohio State in the Rose Bowl.

—Russell H. Wiberg

## New Haven Country Club Scene for ASTE Party

New Haven, Conn.—The annual Christmas party of the New Haven ASTE chapter was held December 11 at the New Haven Country Club. A reception sponsored by Eastern Machine Screw Corp. opened the holiday festivities at 6:30.

The dinner itself was launched by Chairman John Alton who introduced the members of the executive committee and their wives. The main speaker was Carl Bettcher, president of Eastern Machine Screw Corp., who presented some informal notes on the past machine age.

Christmas gifts were given to the ladies by Joe Benson and Frank Schute. A boys' chorus entertained the group with a selection of Christmas carols. Music for dancing was played by Bud Finch and his string orchestra.

—Silas W. Becroft



Pictured at the Evansville ASTE chapter's November meeting are, from left: Bernard Pampe, second vice chairman; Paul Offutt, representative for Logansport Machine Co.; Harry L. Stewart, program speaker for the evening; and Paul Vierling, first vice chairman of the chapter.

## First Prepared Program Ready for Chapters

J. O. Horne, chairman of the ASTE National Program Committee, has announced the immediate availability to all chapters of *ASTE Prepared Technical Program No. 1*, entitled "The Forces in Single-Point-Tool Metal Cutting." This new, free service includes a prepared manuscript, to be read by a chapter member at a specified meeting, and accompanying optional glass slides or strip film.

The first program, illustrated by 45 charts and diagrams, has a running time of 42 minutes. It contains a certain amount of basic theory, along with practical machining applications.

Such important matters are discussed, including: functions of the basic tool angles, chip types, changing from a poor to a better chip type, force relationships to the cutting variables, hardness as a measure of machinability, advantages of higher speeds, and total piece cost vs. permissible tool costs.

Mr. Horne said the Prepared Program Service was developed especially to meet the needs of chapters and stu-

dent groups which for one reason or another have no scheduled speakers for a specific meeting. Programs will also be made available to other engineering groups.

"There is scarcely an ASTE member who could not learn something about single-point turning from this first program," Mr. Horne said. "Frank Wilson, our technical director, has done a skillful job of assembling the findings of many machining authorities and integrating the facts for quick understanding."

Free printed copies of the program, complete with illustrations, will be available at the meetings.

To obtain the program, chapter program chairmen should write to R. J. Bacik, secretary, National Program Committee, 10700 Puritan Ave., Detroit 21, Mich. Be sure to include the following information: time and place of meeting, shipping instructions (allow at least two weeks), whether two-by-two-inch slides or 35 mm strip film is desired, and the estimated number of program copies needed.

Several ASTE officers are shown with two of the entertainers at the Los Angeles chapter's Christmas party. From left: Ivan Scott, orchestra leader; Ralph Chrissie, chapter chairman; Ben Hazewinkel, national director; Les Hawes, chairman of the National Public Relations

Committee; Wayne Ewing, member of the National Membership Committee; Eddie Riddle, second vice chairman; Frank Bale, secretary; Paul Slater, treasurer; Carl Almquist, first vice chairman; and Del Sharbutt, emcee for the evening's program.





# West Coast News

By Andrew E. Rylander

What with Christmas parties and all, there's not much to say about chapter doings except that a good time was had by all. As for myself, I wiggled and slipped and so put my sacroiliac out of whack again, which temporarily put me *hors de combat* as far as several projected plant tours were concerned. At that, I'm over it; can't put a good man down, besides which it didn't ruffle my sunny disposition.

One thing, I've got a red face. Being over the hills and far away, I had figured that by now I'd be out of sight and mind. Then, the holiday greetings rolled in, and Christmas in California took on a new meaning. Ray Gifford, for one, wanted me to know that there's nothing novel about horses and cows treading spirals around California hills. Vermont's got them thar hills too. But here's one for the book, a sign in a Walnut Creek store window: "Genuine snowballs for sale!"

## Visit from Joe Petz

During the holidays, had a surprise visit from Joe and Mrs. Petz, re-honeymooning on their 25th anniversary. They stopped in for a flying visit while enroute to Yosemite. Visiting them at the Mark Hopkins, San Francisco, I had my first ride in one of the famed S. F. cable cars—and it will be my last. But interesting! and, I may add, thought provoking—for if a cable ever broke just when you got to the top of the Mark . . . ! At time of writing, am expecting visits from ASTE'ers Henning Freden and Pete Dubois, both of Detroit, but with the deadline approaching I can only say "hello" in prospect.

Have had a number of letters expressing concern over the recent earthquakes, but those little seismic disturbances were as nothing compared to the shock at the news that Al Sargent had stepped out from Pioneer Eng. & Mfg. Co. Like myself, Al can't think of retiring. Much too young!

## Tours Treasure Island

Some time ago, had a letter from H. C. McDaniel, manager, technical publicity, Westinghouse public relations, suggesting that I get in touch with Carl Albracht, Westinghouse P. R. manager for San Francisco. Sure enough, we got together, along with Bill Briscoe who is in a similar capacity with Bethlehem Pacific Coast Steel Corp., all of which netted me a few

pleasant hours and a peek-in at Treasure Island, ordinarily restricted to Navy brass.

Drove down to San Jose for a visit to Food Machinery & Chemical Corp., John Bean Western Division, where they are assembling the Army's recently announced personnel carriers. There, was shown around by Don Locke, late of the Hudson Tank Arsenal, Detroit, and E. F. (Rock) Roskowski, 1st V. C. of Santa Clara Valley chapter who was recently promoted to chief tool engineer. From what I saw, Rock knows his stuff although a bit inclined to hide his light under a bushel.

Due to close restrictions—it's all "top secret"—there's not much I can say about the defense program. However, it is violating no confidences to say that the work is progressing efficiently and earmarked by excellent tooling. Welding follows more or less conventional procedures for armor plate, although certain innovations indicated really excellent tool engineering. Equipment, both in operation and in process of erection, promises to make the plant a vital force in our country's defense.

Neither does it violate confidences to say that, among other things, Food Machinery & Chemical Corp. manufactures fire-fighting apparatus and orchard spraying equipment, all of advanced design. All things considered, the plant visit was interesting, especially to one experienced in the manufacture of mobile armament.

## New Classes Begin

From Frank Menard, Redwood City, got the news that Santa Clara Valley chapter is sponsoring a course in fundamentals of tool engineering in co-operation with the Extension Services, San Jose State College. Classes, conducted by Carl F. Kaiser, asst. professor of engineering at San Jose State, to be held every Wednesday evening started on January 14.

The course is being offered in two parts. Part one will include economics of tool engineering, administration, metallurgy and production processes. Lecturers on these subjects will include V. G. Aleshin, Dalmo Victor; R. Shriver, Westinghouse; Ben Berlien, Industrial Steel Treating; and Norman Morse of Food Machinery.

Part two, embracing cutting tools, jigs and fixtures, automatic screw machine tooling, die design, and gages, will have as lecturers, Carl Horack

and Roy Denham, Westinghouse; Norman Morse, Food Machinery; and Frank Menard, Frank Menard Mfg. Co. The course will conclude with a summary by Prof. Kaiser.

## Advance Course Planned

Golden Gate chapter, which has been sponsoring a course in the fundamentals of tool engineering, is now preparing to sponsor a course in advanced tool engineering, to start this fall. According to Vern Gallichotte, this course is to be on college level, and will take in students who have completed the fundamentals course. What with scholarships from the ASTE, the world will have what the tool engineers are doing to create a better design for living.

## Situation Wanted

MAN WITH ORIGINALITY wishes to change place of employment. Several years experience in product design and processing. Last three years spent in process developing and cost estimating cold extrusion of steel. At present attending college (evenings), majoring in metallurgical engineering. Please address inquiries to Process Engineer, 1225 Atlantic St., N.E., Warren, Ohio.

## Welding Society Sponsoring Contest

Announcement has been made of cash prizes totaling \$2,250 to be awarded this year by the Resistance Welder Manufacturers' Association for outstanding papers dealing with resistance welding subjects. A wide choice in subject matter is allowed to assure eligibility to all papers which cover worthwhile and significant achievements in the field. The awards will be made at the 1953 fall meeting of the society.

Three divisions, industry, university staff and university undergraduate, have been set up for the contest which closes July 31. A total of six prizes, ranging from \$250 to \$750, will be awarded to the authors of papers making the greatest contribution to the advancement of resistance welding.

The contest is open to anyone, without restriction from the United States, its possessions and Canada. Any member of the American Welding Society in any grade from any country is also eligible. Papers entered in the contest should be sent to American Welding Society, 33 W. 39th St., New York 18, N. Y. If mailed to arrive before July 1, three copies should be furnished. If mailed to arrive after that date, six copies should be provided.



A congratulatory handshake is given to H. W. Van Dyke, center, after his talk at the December meeting of the Greater New York chapter. Shown with him are Chairman Gene Roth, left, and First Vice Chairman Arthur Smedley.

## Metallurgist Reviews Die Casting Alloys

New York—About 160 members and guests of the Greater New York chapter met December 1 at the New York Times Bldg. to hear a talk made by H. W. Van Dyke, plant metallurgist, Doehler-Jarvis Corp.

Mr. Van Dyke discussed the various die casting alloys and their immediate uses. A film entitled "The Shortest Way" pictured the history of the die casting process. Also shown were the methods used in manufacturing and designing die castings.

The coffee talk was delivered by Joseph Kopf, treasurer of the New York chapter of ASME.

—Robert Frechman

## OBITUARIES

### Clifton G. Bigwood

Clifton G. Bigwood, vice president in charge of operations and a director of the L. S. Starrett Co., died suddenly December 8 after 36 years of service to the company.

A charter member of both the Worcester and North Central Massachusetts ASME chapters, Mr. Bigwood joined Starrett in 1916. He held the positions of methods engineers, assistant superintendent, assistant vice president, and was recently elected vice president and director.

### Milton A. Logan

Milton A. Logan, 43, toolroom supervisor of the Westinghouse Electric Corp., Lima, Ohio, died of a heart attack on December 12. A charter member of the Lima ASME chapter, Mr. Logan had been recently elected president of the Westinghouse Veteran Employees Association.

He had been an employee of Westinghouse for 27 years and had been associated with the small motor division for 16 years.

# Coming MEETINGS

DETROIT—March 16-20. Leadership Conference and 21st Annual Meeting of ASTE.

CHICAGO—Feb. 2. Keymen's Club. "New Advances in Boring Practice" by Mr. Kuhn, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

CLEVELAND—Feb. 13. Carter Hotel. Standards Committee presents E. C. Polidor, chief engineer, Engineers Specialty Co., Rochester, N. Y. Election of officers.

FAIRFIELD COUNTY—Feb. 4. "Modern Tools for Bar and Chucking Automatics," by R. R. Rhodehamel of the National Acme Co.

FORT WAYNE—Feb. 11, 6:30 p. m., Chamber of Commerce. Tenth anniversary and election meeting.

GRAND RIVER VALLEY—Feb. 6. Mofat's Banquet Hall, Galt. Questions and answers in "Stump the Experts" program. Members' Night.

GREATER NEW YORK—Feb. 2, 8 p. m., New York Times Bldg. "Glass Cloth and Its Application in Industry" by a representative of the Keuffel & Esser Co., Hoboken, N. J.

HARTFORD—Feb. 2, 6:15 p. m., Windsor Locks. Dinner and tour of the Hamilton Standard Div., United Aircraft Co.

LITTLE RHODY—Feb. 5. "Principles of Locating" by J. I. Karash, tool engineer, Reliance Electric and Engineering Co.

LONG BEACH—Feb. 11, 7:30 p. m. Election of officers and movie.

LONG ISLAND—Feb. 9, 8:30 p. m., Garden City Hotel. Election of officers and travel film. No guests.

MID-HUDSON—Feb. 10. "Ultrasonic Process of Machining" by Arthur Kurus, president, Cavitron Equipment Co., Long Island City, N. Y.

MILWAUKEE—Feb. 12. "Controlled Air

Power" by J. J. Mudd, regional manager, The Bellows Co., Detroit.

MONTREAL—Feb. 12, 7:45 p. m., Montreal Technical School. Program sponsored by Northern Electric Co. on "Methods of Work Simplification."

NEW HAVEN—Feb. 12, 8 p. m., Hotel Garde. "The Effect of Molybdenum in Tool and High-Speed Steel" by Charles McShane, metallurgical engineer, Crucible Steel Co.

NEW ORLEANS—Feb. 11. Election of officers. Program by Dr. A. O. Schmidt, Kearney & Trecker Corp., Milwaukee.

NORTHERN NEW JERSEY—Feb. 10. Film on "This Carbide Age" by the Weston Co.

PEORIA—Feb. 3. Annual election of officers.

PETERBOROUGH—Feb. 5. "Hydraulic Press Tools" by Mr. Williams, The Denison Engineering Co.

PITTSBURGH—Feb. 6, 6:30 p. m., Sheraton Hotel. "Materials Handling" by L. J. Johnson, Mathews Conveyor Co.

PORTLAND (ME.)—Feb. 13, 7 p. m., Graymore Hotel. "Modern Developments in Tool and Die Steels" by Dr. Stewart G. Fletcher, chief metallurgist, Latrobe Steel Co., Latrobe, Pa.

ROCKFORD—Feb. 12. Plant tour of Fairbanks-Morse Co. in Beloit, Wis.

SAGINAW VALLEY—Feb. 19, 7 p. m., Hotel Zehnder, Frankenmuth. Program on selection and heat treatment of tool steel.

TWIN CITIES—Feb. 4. Covered Wagon. Executives' Night. Program on modern punch press methods.

TWIN STATES—Feb. 11, 7 p. m. Tour of Joy Mfg. plant at Claremont, N. H.

## Long Beach Chapter Holds Holiday Party

Long Beach—The holiday season was celebrated by the Long Beach ASME chapter with a dinner-dance on December 12. More than 140 couples attended the party held at the Lakewood Country Club.

After dinner Chairman Frank Wallace welcomed the members and guests and turned over the activities to L. M. Hutchison, program chairman. Prizes were given out and dancing completed the evening's program.

—Wilson C. Irby

## Saginaw Valley Stages Party in Frankenmuth

Frankenmuth, Mich.—A full program of entertainment greeted the 190 couples who attended the Christmas party and ladies' night staged by the Saginaw Valley ASME chapter at the Hotel Zehnder.

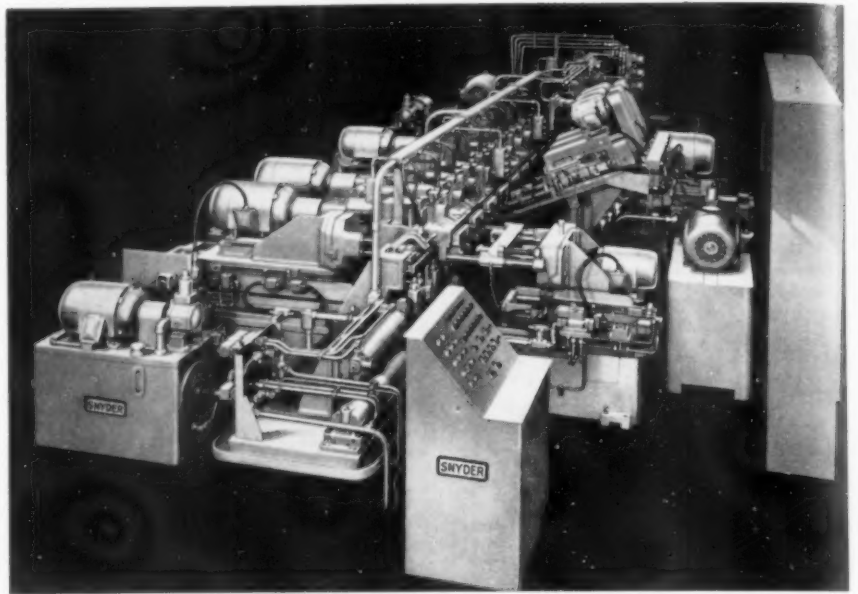
A chicken dinner, served in the well-known Frankenmuth style, was followed by a floor show and an evening of dancing. Corsages were presented from the chapter to the ladies. Music was furnished by Ed Berry's orchestra and Margie Mee. —Ben Phillips

# News in Metalworking . . .

## TRANSFER MACHINE SPEEDS BEARING CAP ASSEMBLY

A specially designed 19-station automatic transfer machine processes main bearing caps in clusters and delivers individual workpieces, sawed apart and sorted, at the rate of 96 pieces an hour. The machine was made by Snyder Tool & Engineering Co. for DeSoto. Processing of the workpiece, a main bearing cap cluster for a V-8 engine, consists of drilling, reaming, spotfacing and tapping holes, milling anchor slots, sawing the cluster into individual caps and sorting the finished parts.

Clamping is hydraulic and the fixture moves throughout the stations by means of a hydraulic operated transfer bar. Although control is automatic, it may be switched to manual. High-speed carbide tools operate at 80 sfpm for drills and 200 sfpm for the facing head; however, feed speeds and strokes vary to suit the individual application. Work cycle is 30 seconds. All heads are mo-



Nineteen-station automatic transfer machine requires floor space 161 x 403 in. Base and column are welded steel construction, braced and normalized.

## NEW Dial Bore Gages

Range  $\frac{3}{8}$ "-1"  
Models 4-5  
Delivery: 2 wks.

Range  $\frac{3}{16}$ "- $\frac{3}{8}$ "  
Models 2-3  
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**perfect visual control  
at machine as well as  
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Available from smallest model  
checking .090" bore to largest  
checking 48 inch bore.

Speed up production; reduce  
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tor-driven through gears which can be changed to give different tool speeds.

A practical point, too, is that the entire operation is automatic and is protected by electrical interlocks, permitting operation by unskilled labor. Even lubrication is automatic.

## ANNOUNCE NAME CHANGE

The firm which was known formerly as Graham-Mintel Instrument Co., has been changed to Cleveland Instrument Co., Inc. According to the announcement, reasons given for adopting the new name were for clarity and simplicity and to avoid confusion in business transactions and commercial transmittance. Personnel, products, facilities, ownership and location remain unchanged.

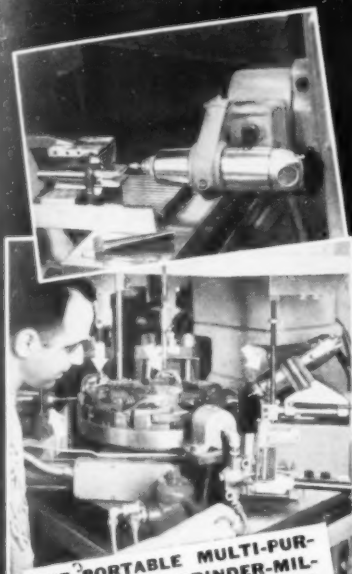
## NATIONAL LEAD BUYS DOEHLER-JARVIS ASSETS

Assets and business operations of Doehler-Jarvis Corp. will be acquired by National Lead Co., to be operated as a division of the purchasing firm, if a present plan is approved by Doehler-Jarvis stockholders. This arrangement will extend National Lead's operations in the die casting field. It already is a leading fabricator of nonferrous metals. Doehler-Jarvis has plants in five cities. Its new plant facilities include a die casting and electroplating plant and an armor plate production unit at Grand Rapids, Mich., and a die casting unit at Pottstown, Pa.

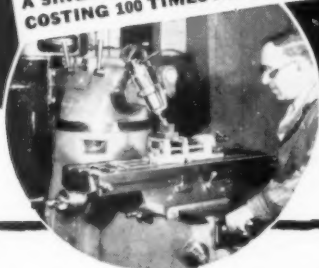


# LOWEST COST PRECISION

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ONE PORTABLE MULTI-PURPOSE PRECISION GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!



Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. 1/4 HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing, rigid PRECISE quill, sealed micro-precision bearings. High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters. PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.

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**GRINDER-MILLERS**

INDICATE A-2-89-1

February, 1953

## SPECIAL FIXTURE HALVES SANDING TIME

The rate of finishing paper-roll-holding wedges has doubled at Behr-Manning Corp. simply by using a special holding device and a coated abrasive belt. The fixture is a wooden 2 x 4, notched to accommodate five wedges, and fitted with a curved handle for operator's comfort and safety. Two wood screw points project from the long side of each notch, and the wedges are then hammered to these points which hold



Above, points of wood screws can be seen projecting from the notches of the fixture. These hold temporarily the wooden wedges which are hammered over them.

Below, five wooden wedges, used to hold stacks of large paper rolls, are sanded together by rocking the fixture across a travelling belt.

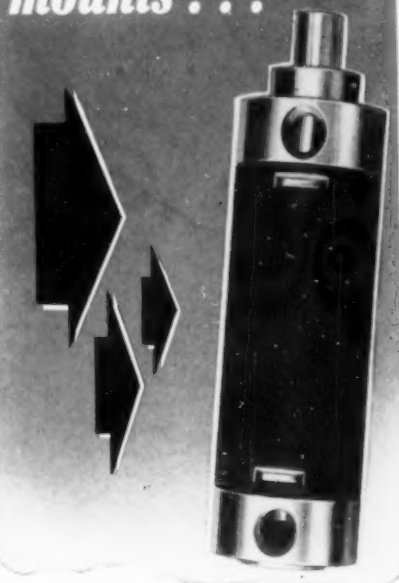


them temporarily for sanding. The wedges are smoothed on the bottom and the bottom edges are rounded off on a traveling rough abrasive belt. The flat section over which the wedges are sanded is backed up by a platen in the machine.

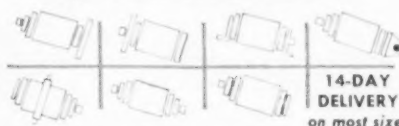
Use of the special fixture permitted sanding of one set of five wedges in about 35 seconds, including time to load and unload the fixture. In comparison it had previously taken about one minute to sand an equal number singly. At the same time, machine operator fatigue was cut nearly in half.

Points of wood screws can be seen projecting from notches of the wedges sanding machine fixture. The wooden wedges are hammered into place over the screw points, and are removed similarly by bumping them with a hammer

*interchangeable  
mounts...*



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**O-M** CYLINDERS  
*adaptable to*  
*any installation!..*



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Because the end plugs are tapped for universal mounting, any one type or combination of mounting brackets can be used to install an O-M Cylinder... without disassembling or changing the cylinder. Interlocking mechanism eliminates projecting end caps and tie rods, assuring better alignment and friction-free performance. Thus, O-M Cylinders fit where others won't... require 1/2 less space than conventional type cylinders of the same bore... are easily removed, inspected, repaired.

Available in a full range of sizes (1 1/2" to 8" bores) with standard, 2 to 1 or oversize rods. All machined steel with bearing bronze, no castings. Completely interchangeable parts. Write today for FREE catalog and complete set of 1/2 and 3/4 scale templates showing all cylinders and mounting brackets.



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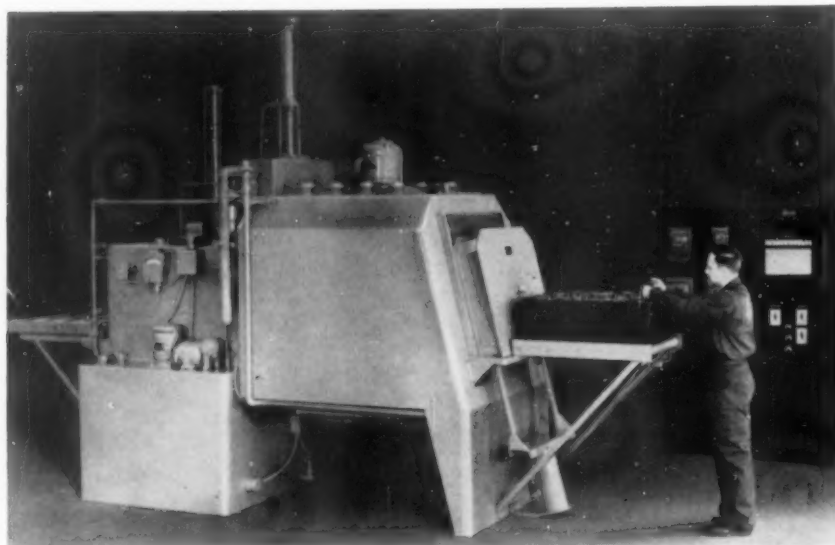
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INDICATE A-2-89-2

# Tools of Today . . . .



## Heat-Treating Unit

A 400 lb per hour automatic heat-treating unit featuring 100 percent forced convection heating has been announced by Ipsen Industries, Inc., 715 So. Main St., Rockford, Ill. The unit operates at temperatures up to 1850 F and has complete automatic straight-through operation from heat through cooling or oil quench. The unit is sealed to provide absolute atmosphere control during the entire heating and quench cycle, assuring bright, scale-free work on all types of heat-treating processes such as carburizing, carbonitriding, etc.

The 100 percent forced convection system employs nonalloy radiant heating tubes, baffles, and a powerful fan mounted in the roof of the furnace. The tubes are spring loaded and positively sealed by means of compression bellows and are designed for either gas-fired or electric heating elements. The heating tubes are mounted vertically between the brick insulation and an interior demountable baffle. A powerful alloy fan forces the endothermic atmosphere around the baffles, past the radiant tubes, and then up through the floor and the work. The fan is short-coupled to a special slow-starting motor with water-jacketed bearings and built-in safety switch. The fan is removable through the top baffle opening without disturbing brick or tile work.

The T-400 model straight-through design saves handling time and loading delays. Work is loaded directly into the heating zone, and after proper time at heat, the work tray is automatically

transferred onto a quench-cool rack which holds load for atmosphere cooling, or lowers it for oil quench, whichever has been preselected on the cycle control panel. As soon as the tray is on the rack, a new load can be put into the heating zone immediately.

The T-400 is used to normalize, stress relieve, harden carburize, carbonitride, and braze. The unit can be supplied with a special insulated tank for martempering or hot oil quenching.

**T-2-901**

## Steel Cladding Machine

Knapp Mills, Inc., New York, has announced an automatic machine which will produce a perfect chemical bond between lead and steel. In one day one small machine will clad a steel surface that would require 8 to 10 man-days to cover by hand techniques, according to the company.

With this method the steel is first prepared through leadizing and then lead of any desired thickness can be applied. The lead will not separate from the steel in service unless it is melted off at temperatures close to 621 F, the melting temperature of lead itself.

Such machines will chemically bond a strip of lead up to 12 inches wide by  $\frac{1}{4}$  inch thick to prepared steel. The operator can control the width and thickness of the lead cladding by regulating the speed of the machine and by spreading or narrowing the two cladding heads with which it is equipped.

An advance in design over earlier models makes it unnecessary for the machine to carry its own lead supply. A strip of lead is laid down under the machine; the cladding heads melt this lead and chemically bond it to the steel as the machine automatically moves across the plate. The machine is so designed that it may also carry its own lead supply in tubular feeds at the front of the unit. While the machine may run free, directly on the steel, it will also operate on a track. By taking off the bottom carriage, reversing it, and mounting it on the top of the machine, the unit will run on a light-weight aluminum or magnesium beam so it operates in a tank shell as well.

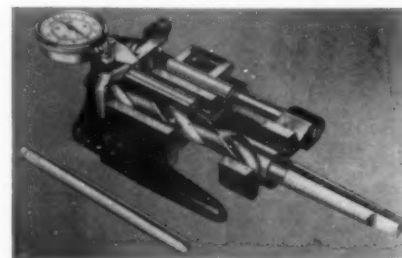
The whole carriage may be turned to clad lead on either the right or the left side. With all of its versatility and many functions, the unit described weighs less than 15 pounds. Even though the cladding heads direct intense heat on the lead and steel beneath them, the machine itself does not even become warm in operation.

A hand-operated model has also been designed. This hand tool may be used to burn lead to lead as in welding sheet lead and pipe. The hand unit, weighing less than 10 pounds, operates without a carriage on a single wheel or tripod arrangement with a grip for the operator.

**T-2-902**

## Drill Point Checker

The Matrix drill point measuring instrument checks the drill point angle and its centrality. Two vees support the straight or tapered shank drill. On a common indicator dial, centrality is read directly to 0.001 inch and angle



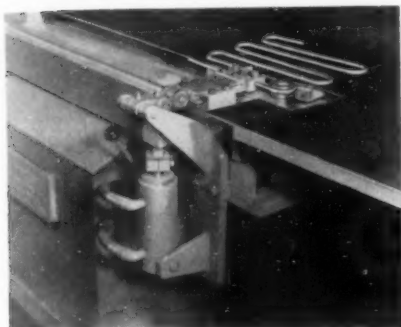
to one degree. This portable unit will insure correct hole size and optimum drill life. Setting standards are supplied for standard drill point angles.

The Matrix instrument is furnished in two sizes:  $\frac{1}{4}$  to  $\frac{3}{4}$  inch; and  $\frac{3}{4}$  to  $2\frac{1}{2}$  inches. Made by Engis Equipment Co., 431 S. Dearborn St., Chicago 5.

**T-2-903**

## Coil Bender

A semiautomatic machine for serpentine coil bending is announced by Pines Engineering Co., Inc., 601 Walnut St., Aurora, Ill. This small unit is designed especially to fit production line needs. The semiautomatic bender is equipped with a single control lever, a stationary bending form, a rotating wiping shoe, and a semicircular table to maintain long coils in a horizontal position during the sweep of the bending cycle. The control is arranged so that the operator can conveniently handle the positioning of the workpiece with speed and a minimum of effort.



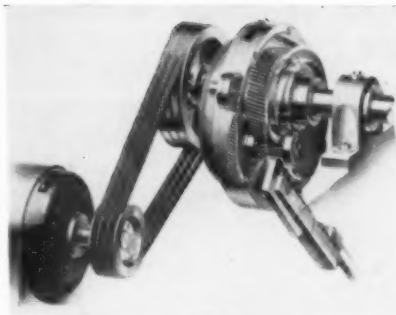
In bending continuous serpentine coils, the first bend is completed in a conventional manner, after which the stock is rotated 180 degrees before clamping for succeeding bends. One movement of the operating lever initiates the entire clamping and bending cycle. The rotating wiping shoe is designed with a curved face and operates with a cam effect. This allows the operator to return the wiper immediately after completing the bend by reversing the operating lever. Production averages 450 bends per hour. This machine will handle tubing up to one inch OD, 16-gage, and five feet in length. Die height of machine from the floor is 35 inches, and overall dimension of the base of the unit is 74½ x 15 inches. The unit is equipped with a Vickers self-contained power pack, which provides a bending speed of 29 rpm. A 3-hp motor is used, and pump delivery is 7 gpm at 1000 psi. **T-2-911**

## Speed Reducer

The American Pulley Co. 4200 Wisahickon Ave., Philadelphia 29, announces Shaft-King, a series of 20 to 1 ratio speed-reduction units featuring improvements in gears, bearings, housing, lubrication and oil sealing systems.

Gearing in the speed reducers consists of two trains of the single-helical type. Gears are precision-cut from alloy steel forgings and are flame-hardened.

An exclusive construction feature is the use of both ball bearings and tapered-roller bearings where each can



be utilized most effectively. Longer bearing and gear life is made possible by the three-wall housing.

Gearing and bearings are continuously splash-lubricated by the high-speed gear and the counter-shaft pinion which run in a large oil reservoir in the lower third of the housing.

The concentric shaft design places both input and output shaft above oil level; therefore, bearing seals do not operate against a head of oil. An additional feature is a leak-proof, anti-friction oil-sealing system.

Interchangeable split-tapered bushings with locking nuts eliminate fretting corrosion and make the units immediately adaptable to any shaft size up through 3¼ inches. The speed reducers are easily mounted directly on the shaft of the driven machine and require only standard shaft lengths for mounting. **T-2-912**

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# Quick Change Tools

**FOR**

- **BORING**
- **MILLING**
- **DRILLING**
- **& TURRET**
- **LATHE USE**

**P. D. Q.**  
(PORTAGE DOUBLE-QUICK)

Changes from one tool to another is a matter of seconds. Three point locking feature and tapered shank assures repositioning and eliminates "run out." Send for catalog describing individual holders and adapters or for specific information on your machine tools.

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Get the graphic story. . . Nelco carbide tools assure faster, better, more profitable production.

Nelco Tool versatility—actually your assurance of *special tools at standard prices*—is shown in the nearly 800 carbide cutters Nelco regularly maintains in stock. In the Nelco line of 4 flute end mills alone, there are available 63 standard cutters in diameters from  $\frac{3}{8}$ " to 2".

Diamond-hard carbide swiftly chews through the toughest metals—works to closer tolerances and leaves finer finishes than conventional cutters. Higher table feeds mean MORE production. Costly down time is slashed! Nelco tools stay sharper longer—mill more pieces per grind. Nickel shim brazed carbide tips on alloy steel bodies mean year after year of service free operation.

Nelco SERVICE extends directly into your plant! An experienced Nelco field engineer will be glad to discuss, suggest, troubleshoot *in your plant, on your machines*.

Unusual, out of the ordinary tools described in this catalog can be designed or built to your specifications by Nelco carbide technicians.

# NELCO TOOLS

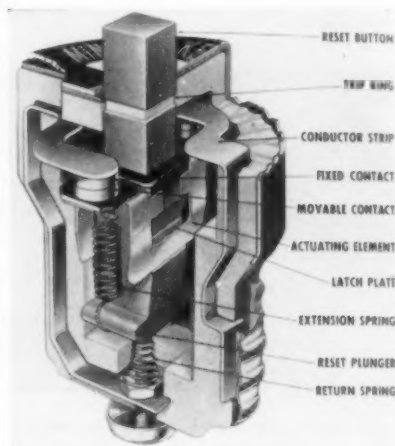
For that Extra  
**EDGE** in Production

NELCO TOOL COMPANY, INC., MANCHESTER, CONNECTICUT

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## Circuit Protector

Mini-Breaker is a permanent type circuit protective device that fits like a fuse in any standard Edison base fuse holder delivering up to 125-volt a-c service. It requires no additional equipment and no special wiring when applied to branch or main circuits of corresponding 15, 20, or 30-ampere ratings. Anyone can install it in a matter of seconds, and anyone can restore electrical service simply by pressing in and releasing its shock-proof reset button.



Although many attempts have been made to develop such a practical fuse-replacement device, Mini-Breaker is claimed to be the only one of its kind to meet all the essential design, safety, and performance requirements established by Underwriters' Laboratories, Inc.

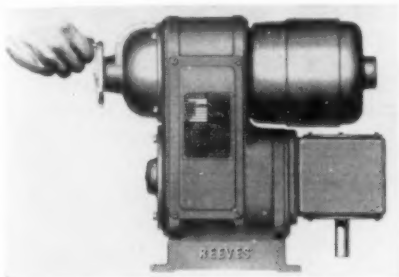
The device is rated to: (1) safely interrupt a 5,000-ampere, 125-volt d-c calibrated circuit once; (2) trip at 200 percent load within 120 seconds at 25 degrees F; and trip at 125 percent load within one hour at 25 degrees C; (3) complete 35 cycles manual make-and-break at 150 amperes for the 15 and 20-ampere devices, at 180 amperes for the 30-ampere device; complete 15 cycles manual make-and-automatic-break at same overloads, with both tests conducted at 125 volts ac, 60 cycles, 50 percent power factor; (4) make and break its rating in tungsten filament lamps four times at two-minute intervals without automatic trip or welding of contacts; (5) carry its rated current indefinitely, with rise on center contact and screw shell not exceeding 50 degrees C; (6) interrupt calibrated 5,000-ampere circuit, 125 volts ac, 60 cycles, at 50 percent power factor three times; (7) meet dielectric strength requirements after completing the a-c short circuit test.

For further information, write Mechanical Products, Inc., 1824 River St., Jackson, Mich.

**T-2-921**

## Right Angle Drive

Reeves Pulley Co., Columbus, Ind., announces the addition of a fractional hp Vari-Speed Motodrive with right-angle reducer to its line of variable-speed drives and controls.



The drive combines in one unit any standard NEMA frame, type C, face-mounted motor; the Reeves speed-varying mechanism; and the right-angle worm gear reducer. This right-angle reducer is available on all fractional hp Motodrives in either horizontal or vertical models; with speed ratios from 2:1 through 10:1.

The design of this drive assures a self-contained unit that is small and compact, yet rugged. The output shaft drives up, down or at right angles in the horizontal type of units and drives down or at right angles in the vertical model. The right-angled shaft arrangement is of advantage in many applications, saving floor space by making it possible to put the fractional hp Motodrive flat against the driven machine or by mounting the Motodrive directly above or below the driven equipment.

The right-angle reducer, an alloy steel helical worm and bronze gear, is built to withstand heavy-duty, continuous operation. All gearing and bearings are adequately lubricated and the case is properly sealed to insure against any oil leakage.

Handwheel control is standard on these drives but electric remote and mechanical automatic controls can be applied. For further information, request bulletin No. M-522. **T-2-931**

## Liquid Gasket

A new type of gasket which provides an improved seal at lower labor and material costs is now being offered as a replacement for conventional precut cork or rubber gaskets. It can be used in a wide range of manufacturing industries where component parts require gaskets, according to the manufacturer.

Called the flowed-in gasket, it is applied as a liquid, synthetic rubber

or resin compound, forced through a nozzle onto a spinning component part and then baked to form a solid rubbery gasket which will not fall off the part. The gasket can be applied either automatically or semiautomatically, depending upon lining equipment used, and in varying types, thicknesses and diameters.

Chief advantages claimed over conventional precut gaskets are lower material cost; faster application, since the gasket does not have to be crimped, stamped or glued to hold it in place; better sealing qualities; decreased material ordering and stocking, since one compound often will replace more than one type of precut gasket. Specially formulated compounds can be made to provide effective seals against moisture, oils, gasoline, many solvents, heat, pressure, vacuum, weather, and vibration. Also, compounds can be formulated to produce either cellular or solid gaskets as well as gaskets which swell to insure hermetic sealing of an enclosed seam.

Application equipment is automatic or semiautomatic. On the automatic lining machine, which can apply gaskets at speeds up to 300 parts per minute depending upon size of parts to be lined, the parts are belt or gravity fed to the machine and then to the chuck. The chuck spins the part under an adjustable nozzle which squirts a precisely measured amount of compound into a groove or channel on the part. The lined part then moves off onto a conveyor belt to an oven where it is baked. The machine handles parts from  $\frac{3}{4}$  to 12 inches in diameter. If belt-fed, high-speed equipment is used, no operator is necessary.

On the semiautomatic machine, the part is manually placed on the chuck which rises at the touch of a foot pedal and spins the part beneath the nozzle. The nozzle automatically lines the part with a measured amount of compound, and the chuck drops. The part is then removed by hand for the baking operation. In both cases, baking time depends on type of compound used and the size of gasket. The machine requires a single operator and has a capacity of up to 50 parts per minute depending upon size of part and operator's skill. Since it will line parts measuring from  $\frac{1}{2}$  to 23 inches diameter, the semiautomatic lining machine has the advantage of versatility as well as of low cost.

Made by Dewey and Almy Chemical Co., 62 Whittmore Ave., Cambridge, Mass. **T-2-932**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

# New!

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TRADE MARK

# Cemented Diamond Particles



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Reduces set-up time—increases production.

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Koebelite CDP (Cemented Diamond Particles) Tool for Ex-Cell-O and J & L Thread Grinders, pictured above.

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FIRST to give diamond users the advantage of diamonds set in powdered metal.

INDICATE A-2-93-2



# IMPACT for Chucking

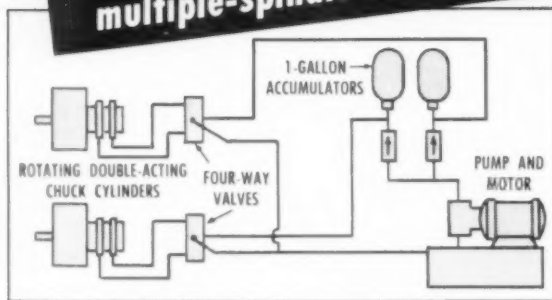
**GREER ACCUMULATORS**  
deliver hydraulic SURGE on  
multiple-spindle machines



## Functions Performed by GREER ACCUMULATORS

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  - b. Auxiliary power source.
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2. **PRESSURE-VOLUME COMPENSATOR** for
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3. **DISPENSER OF FLUIDS** and Lubricants.
4. **TRANSFER BARRIER** for Fluids and Gases.
5. **SHOCK ABSORBER** to
  - a. Absorb line shocks.
  - b. Reduce pump pulsations.

**Greer Hydraulics, Inc.**  
4118th Street,  
Brooklyn 15, N. Y.



Greer Accumulators deliver the hammer-like blow on the chuck jaws required to seize and release work on automatic multiple spindle machine tools. In the above simplified, schematic diagram the Greer Accumulator not only supplies power for actuating the chucks but also maintains line pressure for holding the work securely. A low-volume, high-pressure pump charges the accumulator during intervals between chucking. Without the accumulator, a pump to deliver the required surge of fluid would have to be so large and costly as to be economically impractical.

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Sales Representatives in Principal Cities

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FOR FURTHER INFORMATION USE READER SERVICE CARD: INDICATE A-2-94

## Air Cylinders

A line of hydraulic cylinders (working pressures up to 2,000 psi (3,000 psi in non-shock service) is now available. Identified as series J cylinders, these units comply with JIC specifications and feature all-steel bodies, bored barrels, hardened piston rods, rod scrapers and new cartridge-type packings. Cushions are optional.

According to the manufacturer, the score-resistant, hardened piston rod and improved gland packing, protected by rod scrapers assure longer service life for the series J cylinder in foundries and mills processing ceramics, rubber and steel where abrasive dusts cannot be avoided.

Fabricated steel end caps and heavy wall steel tubing combine to make the cylinder body unusually resistant to damage by rough handling encountered in mills and foundries. Barrels are bored before honing to insure precise piston ring fit for full length of stroke.

The cylinders are regularly available for oil or water hydraulic service in bore sizes up to 10 inches in diameter. For further details and dimensions of standard foot, flange, pin-eye, and trunnion mountings write to Hydro-Line Mfg. Co., 19th St., Rockford, Ill.

T-2-941

## Jet Blade Gage

Two gages that speed the checking of external and internal pitch diameters of the root forms on jet engine blades and blade carriers have been developed by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn. Both units are used as hand gages in conjunction with a standard P & W Air-O-Limit Model F comparator.

The blade root gage design incorporates a carbide roll-type anvil which is adjustable to accommodate various sizes of root forms. The gaging point, opposite the roll-type anvil, is a carbide ball-point spindle which operates the single air nozzle. A carbide roll pressure shoe spans the gage point and provides positive location of the gage on the blade root during the gaging operation.

Prior to the installation of this equipment, pitch diameters of fir tree root forms were checked by the relatively slow method of hand micrometers and thread measuring wires.

The carrier gage is designed to check the pitch diameter of the internal root forms in the jet engine blade carrier. The design incorporates a carbide roll-type anvil and carbide gaging roll. The carbide gaging roll is on a pivot arm which operates the single air nozzle. Both gages are set to minimum and maximum masters.

T-2-942

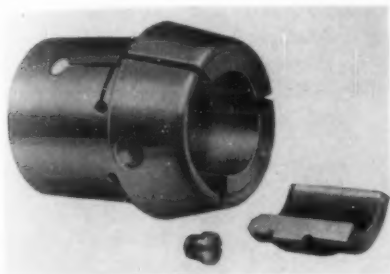
**The Tool Engineer**



## Collet Pads

A collet pad called the Universal No. 1 has been designed for use with the Hall Model B 2-inch collet chucks, and fits any standard make master collet made for the No. 3 collet pad.

The parts are hardened and ground, with a special black oxide finish to prevent rusting. The pads are now available in round sizes ranging from  $\frac{1}{8}$  to  $1\frac{1}{32}$  inch by 32nds. Hexagons from  $\frac{3}{16}$  to 1 inch by 16ths and square  $\frac{1}{4}$  to  $1\frac{1}{2}$  inch by 16ths.



Simplified construction of Hall push-out type collet chucks makes them easy, fast and safe to operate, it is said. There are no latches, fingers, cams, dogs, locks or other irregular parts. It is not necessary to stop the lathe to reset work since the Hall chuck is opened and closed with a slap of the hand while the lathe is running full speed.

Further information may be had from Hall Mfg. Co., 622 Tularose Drive, Los Angeles 26. **T-2-951**

## Control Valve

Pneu-Trol Devices Inc., 1436 Keating Ave., Chicago, has introduced an improved flow control valve, equally efficient for air or hydraulic use. Said to be the most compact and efficient valve of its type, the flow control valve provides full flow in one direction and a wide range of adjustments in the opposite or controlled direction. The new valve incorporates a floating retro-ball check and a unique improved gland structure of the needle.

The gland structure combines the O ring sealing principle with an adjustment locking feature. A light, helical spring does not load the ball, but locates it in the most sensitive floating position to the seat, regardless of the position in which the valve is mounted.

Pneu-Trol flow control valves are made in 5 pipe sizes,  $\frac{1}{8}$  to  $\frac{3}{4}$  inch, and are made from solid hexagon bars of brass, aluminum, steel and stainless steel. All other parts are stainless. Male end fitting tube adapters are available in the same material as valves. Operating pressure is up to 5000 psi.

**T-2-952**

# Sure Cure

## for a CUTTING HEADACHE

If you have a cutting headache, caused by tool failure, take this three-way cure:

- (1) Use Kennametal cemented carbide . . .
- (2) in tooling designed by our engineers who know carbides from the ground floor up . . .
- (3) applied with the help of our field engineers whose aggregate experience is greater than that of any other carbide tool manufacturer.

This cure is working in thousands of shops—handling jobs which no other tools can do. But, even if you don't have a cutting headache, consider this important point:

Tooling that takes tough jobs in stride is the kind to use, also, on routine jobs where floor-to-floor time and overall cost-per-piece must be determined with accuracy, and maintained.

That tooling is Kennametal. Let us prove it in your shop. Kennametal Inc., Latrobe, Pa.

# KENNAMETAL

CEMENTED CARBIDE TOOLING  
THAT INCREASES PRODUCTIVITY



## 300-Amp Welder

A redesigned 300-ampere a-c welding transformer, featuring stepless current selection from 40 to 375 amperes, has been announced by the General Electric Company's Welding Department.



The new welder, for practically all applications from light-duty, low-current sheet-metal work to heavier-duty, high-current industrial jobs, incorporates an enlarged scale and finely threaded screw adjustment to facilitate easy current selections. It accommodates electrodes from 3/32 to 1/4 inch in diameter, and has a handy range switch which enables the operator to change quickly from high to low or low to high range.

Arc-stabilizing capacitors in the redesigned equipment contribute toward increased production by enabling the operator to strike and maintain an arc without popouts, G-E engineers say.

Extra protection against high temperature coil failure is provided by silicone insulation, a resin which retains its mechanical and electrical strength at high temperatures. To further protect the coils from hotspots, they are ventilated by a forced-draft fan rated for continuous duty.

The G-E welder is built with studs at the base to simplify connecting electrode and work cables. Power-factor-correction capacitors assure low-power costs. The welder is 36 inches high, 21 inches in diameter, and weighs approximately 328 lb.

**T-2-961**

## Cutoff Press

A 35-ton press, with air-operated clutch and brake, has been announced by American Roller Die Corp., 20500 St. Clair Ave., Cleveland 17. The Ardcor press features dependability and accessibility and was developed as a cutoff machine in conjunction with Ardcor cold rolling mills.

The clutch has a double cylinder. Each cylinder piston rod causes right- and left-hand acme nuts to rotate toward the flywheel, and the flywheel

cage. Each nut carries one aluminum shoe with a riveted lining. The spring-set air-released brake is on the opposite end of the crankshaft. Maintenance cost is reduced because wear is virtually limited to the linings. Scoring is eliminated because rivet heads cannot come into contact with the discs. Discs are securely bolted in place, instead of floating in teeth or splines. The basic actuating mechanism is so designed that linings are positively and automatically withdrawn from contact with the discs. Drag is thereby eliminated. Shoes and linings can be changed in minutes. No special tools are required, and the unit does not have to be removed from the press.

The forged crankshaft is carried on double-row Timken bearings.

The shut height adjustment is in the head of the press. To adjust, the lock nuts on either side of the upper bolster plate are loosened and the adjusting screw under the dome cover is rotated. Perfect alignment is assured by means of a center pilot. The press is supplied complete with motor, belts, and all controls. Electrical controls for inching and single stroke are standard. When the press is equipped with rails for a "flying cut-off die," a heavy-duty switch is provided on the press to automatically operate the clutch when the stock actuates the flag on the runout table. This same press can also be equipped with bolster plates in place of the rails and be arranged to operate as a continuous automatic dicing machine.

**T-2-962**



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... the answer to ALL your centering problems

INTOCO centers are of two-piece design, consisting of a shank and replaceable tip. Just 5 different sizes of tips when used with the proper size INTOCO shanks fit all sizes of Morse, Brown & Sharpe, and Jarno tapers.

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## Bushing Driver

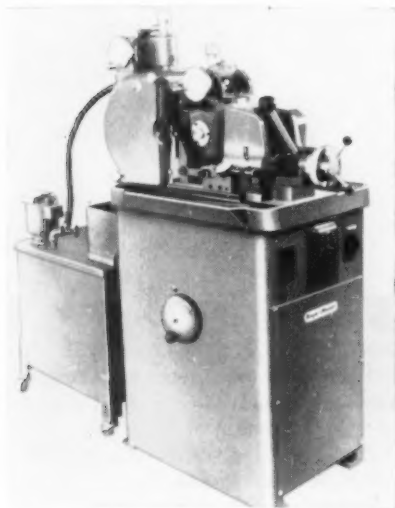
The Titan Tool Co., Main St., Fairview (Erie County), Pa., recently announced a bushing driver for driving threaded inserts for aircraft and general industrial applications.

Design features of the production tool provide automatic positioning of threaded inserts to the proper depth below the face of the casting. A ball-bearing pressure plate prevents backing the insert out after driving. The standard Titan bushing drivers are equipped with  $\frac{1}{2}$ -inch female square drive to drive threaded inserts 0.010 inch below face of the casting and are manufactured in sizes for all threaded inserts commonly in use.

T-2-971

## Centerless Grinder

Announcement is made of the Royal master centerless grinder, TG-123, by its manufacturer, Royal Master Metal Products Co., State Highway 23, Riverdale, N. J.



The TG-123 handles  $\frac{1}{16}$  to 1 inch diameter straight or contour work. Tolerances as fine as 0.0003 inch can be consistently held. Closer tolerances may be obtained with an increase in the knowledge of centerless grinding and familiarization with the machine's operation. Low microinch finish is easily obtained.

Because of its work capacity range and compactness, the centerless grinder is valuable not only in toolrooms and job shops but also in the production line. Floor space requirement is only 23 x 36 inches (exclusive of the coolant tank). Power is supplied by a 3-hp motor.

A range of 30-480 rpm of the regulating wheel spindle is provided through an infinitely variable speed drive. This gearless drive eliminates the possibility of a gear tooth pattern

on the work. The regulating wheel is mounted between ball bearings.

The grinding wheel spindle is mounted in preloaded super precision ball bearings that are permanently lubricated at installation. A large, easy-to-read sizing dial permits setting in tenths. The manual infeed lever that is extremely easy to operate is in a convenient, accessible position. Provision has been made for mounting a 0.0001-inch indicator. Standard equipment includes manual wheel dressers of the contour dressing type.

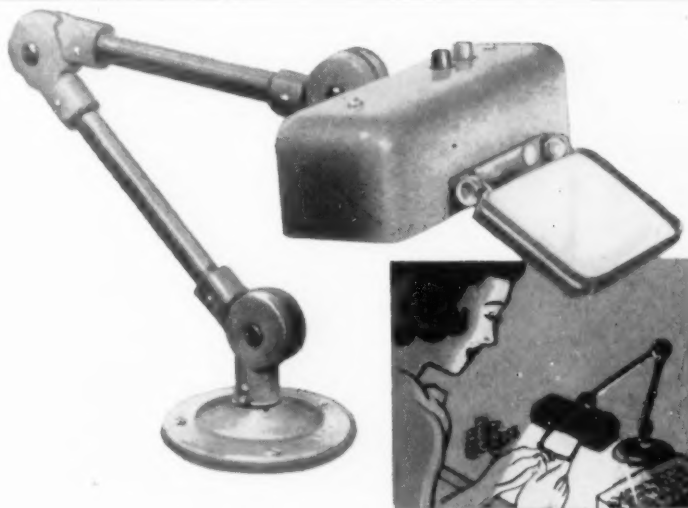
The coolant tank is a completely separate unit mounted on large casters. This lends to easier and more thor-

ough cleaning and permits the tank to be moved anywhere in the shop as an emergency coolant unit.

Available auxiliary equipment includes: bar feed and infeed work rest, packaged hydraulic power unit for multiple production (infeed-plunge type of work) that can be installed in one-half hour by anyone; also an hydraulically operated wheel dresser for work wheel.

T-2-972

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To check the surface finish of such rings during manufacture and before final assembly, Federal relies on the Profilometer as an essential part of their production process.

Federal, previous to the adoption of the Profilometer, checked surface finish visually; and after assembly tested for smoothness of operation under pressure run-out. Due to the exacting standards which the company maintains, this method often slowed production due to surface finishes. With the adoption of the Profilometer, however, surface finish of the bearing rings is now checked *before* final assembly. Result—precision quality control of bearings at all times during manufacture and a minimum of rejects prior to final bearing assembly.

This is just another example of how industry today is using the Profilometer in production processes as an important shop instrument.

*To learn how the Profilometer can help cut costs in your production write today for these free bulletins . . . Practical Operating Features of the Profilometer; Your Needs in Roughness Measurement.*



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**Instrument Manufacturers**

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## Electronic Micrometer

Model W electronic micrometer permits measurements to 0.00002 inch without any measuring pressure being exerted on the work. All measurements are direct measurements. The measuring head consists of an extremely accurate micrometer screw. An electronic circuit, sensitive to five millionths of an inch displacement at the micrometer tip, gives a visual indication at the moment of contact but before pressure is exerted.



The model W electronic micrometer is especially designed for use in research, development and performance testing of diaphragms and bellows used in flight instruments, temperature, refrigerator, and other types of controls where a pressureless means of testing is required.

Made by J. W. Dice Co., Englewood, N. J. **T-2-981**

## Electrode Plater

This unit is designed specifically to platinum plate electrodes for chemical analysis, but it is also of use for plating other metals and as a source of direct current for various applications. It can be used particularly well for plating electrodes of the Leco carbon determinator.

Plugged into a 115-volt, 60-cycle source, it is a full-wave rectifier, delivering up to 6 volts dc and up to 900 milliamperes. The current is filtered to less than a 5 percent ripple. Both a voltmeter and ammeter are mounted on the unit, as well as a rheostat knob, and a current reversing switch. The latter is of particular advantage for plating procedures calling for alternate deposition of platinum on one electrode and then the other.

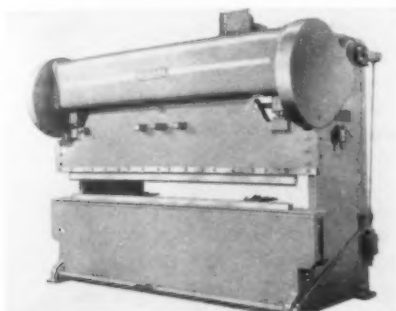
Alligator clip heads for holding the electrodes in the plating solution are also included. A fuse, mounted on the outside of the metal housing, protects the unit from accidental short circuits when touching the alligator leads together. Made by Laboratory Equipment Corp., St. Joseph, Mich.

**T-2-982**

**The Tool Engineer**

## Press Brakes

A line of all steel press brakes which includes a 50-ton series, a 100-ton series and a 150-ton series is announced by Niagara Machine and Tool Works, Buffalo 11. Bending, curling, jogging, corrugating, notching and punching are only a few of the many operations these machines can perform.



Among their many features are laminated nonmetallic ways which maintain accurate alignment and reduce wear to a minimum. Double reduction gearing and a double end twin drive with gearing enclosed in sealed baths of oil provide a smooth, balanced, efficient means of transmitting power to the ram.

The powerful air-cooled clutch and brake can be controlled either by foot treadle or by palm buttons fastened to the ram which permit jogging, single stroking and continuous operation. With a motor reversing switch, the fly-wheel can be reversed to pull the ram out of accidental stalls.

A deep crown and twin plate bed permanently welded to the side frames form a rigid one-piece frame which maintains accurate alignment with minimum deflection.

Self-locking, power-operated ram adjusting screws are fitted with micrometer dials to permit duplication of settings for repeat jobs. By uncoupling the shaft between the screws, the ram may be tilted by power for tapered work.

Niagara brakes can be supplied with gages for front or rear of the machine. Also, angle support brackets and bolster plates can be furnished to convert them for stamping operation.

T-2-991

## Die Retainer

A design feature that provides a positive die retainer and a simplified interchangeable die removal method on Wales type CJ hole punching units has been announced by the Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y.

This development permits the interchangeable dies to slip-fit in the holders

and to be fastened into position by a threaded pilot pin. The threaded pilot pin is tightened or removed with a hex wrench.

Each hole punching unit consists of a holder that carries the punch, die and stripping mechanism. This design eliminates the necessity of attaching punch to press ram and assures permanent alignment of punch and die. With these units, dies may be made and put into operation long before a custom-made die. By reducing perforating die making to such a simple assembly job, any good mechanic can assemble these units into a hole-punching die for op-

erating in stamping presses or press brakes. High-cost die-setting time is eliminated.

Setups are made on T-slotted plates or templates for stamping presses and on slotted plates, rails or strip templates in press brakes.

By simply placing the setup on the press bed it is ready to start punching with the first stroke of the press without adjusting the units, punches or dies. Due to the uniform shut height of type CJ hole punching units, the press ram requires only one adjustment regardless of the number of hole-punching patterns placed in operation. T-2-992

## Cut Costs in Large Hole or Deep Hole Drilling with

## WAUKESHA Inserted Blade SPADE DRILLS

WAUKESHA Inserted Blade SPADE DRILLS are low in first cost. Further, each size of tool holder accommodates blades with diameter variations up to  $\frac{1}{2}$  inch. One holder does many jobs.

And the WAUKESHA Spade Drill body lasts for years and years. Like your safety razor you replace only the blade when finally worn out. WAUKESHA Inserted Blade SPADE DRILLS are the most practical tools for turret lathe and deep hole drilling. Both types of WAUKESHA SPADE DRILL Holders have coolant holes which assure an ample supply of coolant to flush out chips. Try WAUKESHA SPADE DRILLS in your plant. Order one today.

## WAUKESHA TOOL COMPANY

1428 Arcadian Avenue  
WAUKESHA, WISCONSIN

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### WAUKESHA SPADE DRILLS with short length heads

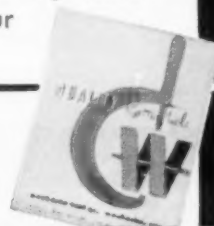
WAUKESHA Spade Drills are available with stub heads for use with your own holders and adapters for extremely deep hole drilling. Make your holder to fit your job and pay no premium for a "special" tool.

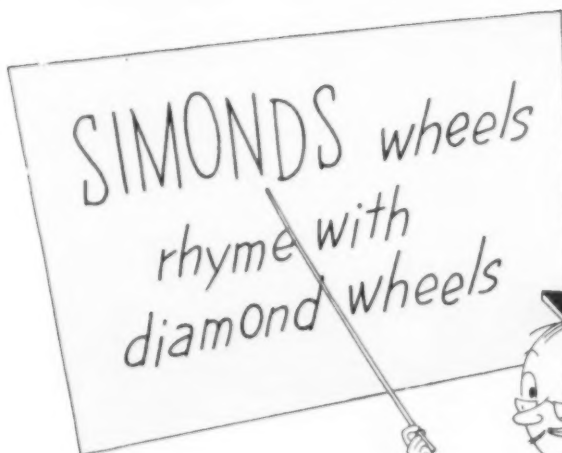


### Wide Range of Sizes in Stock

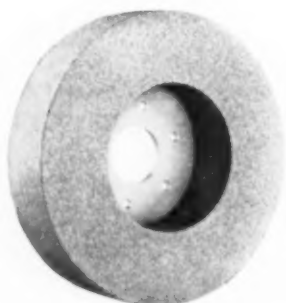
Standard sizes from 1-1/32" to 5" in constant stock. Orders for special sizes or special types (such as rear piloted and short length spade drills) are given immediate attention.

FREE! New quick reference catalog. Gives complete specifications of all standard tools and prices. Send for it today.





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**SIMONDS WHEELS**  
cost much less



Sharpen your carbide tools the economical way. Avoid damaging sensitive edges. Prevent shape distortion. Use Simonds' G Electroton (silicon carbide) grinding wheel. It's the popular "green" wheel... less expensive than diamond wheels... but a "gem" for safe, cool grinding that prolongs tool usefulness.

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Write for your copy of our bulletin (ESA 181) about G Electroton wheels, including type PM (plate mounted) and tool and cutter shapes—All available from stock. Your Simonds Abrasive distributor is equipped to serve you locally. We'll gladly send you his name too.

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-100

## Precision Balances

A line of precision torque balances manufactured in Holland has recently been introduced in the U.S. by the Ohaus Scale Corp., 1050 Commerce Ave., Union, N. J.

They are particularly suitable for use in the metalworking field where a high degree of accuracy is required. In drawing and finishing of tungsten wire or similar materials it becomes impractical to measure in any other manner than weight per unit length. The balance is convenient to operate and large numbers of accurate weighings can be made in a short time. A special wire cutting device for tungsten or other wire is available as an accessory to the balance. This is a precision sampling device constructed to insure uniform lengths of wire regardless of individual operator differences.

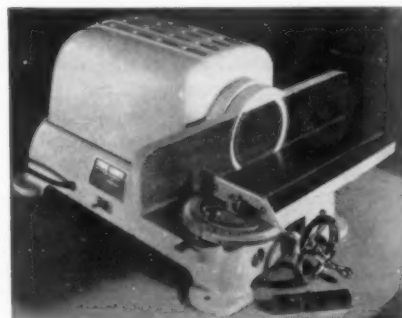
These balances feature a patented torsion system which eliminates mechanical axle friction. The balances are also equipped with a special damping device which speeds weighing, but does not affect the sensitivity. Other features include eye level reading, resistance to shock, and a reading device which eliminates parallax and does not have a vernier.

There is a wide range of models, with capacities from 1 milligram to 20 grams, and with sensitivities from .002 milligram to .02 milligram.

T-2-1001

## Hand Grinder

This machine was designed to grind extremely flat and square surfaces, by hand, without expensive fixtures or a skilled operator.



A 5-inch cup wheel is mounted on the end of the motor shaft and is adjusted to protrude slightly through a stationary fence along which the work is moved. Since center section of fence is on same plane as outer sections, a flat surface is easily produced.

The machine base and fence are made of cast iron, the cover is aluminum. Net weight is 126 pounds.

For information, write Southwest Machine Works, 1309 Bridge Blvd., S.W., Albuquerque, N. M. T-2-1002



# THE TOOL ENGINEER'S

# Service Bureau

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-2-162-1	Acme Industrial Co. ....		New Acme Bushing Catalog simplifies, speeds bushing selection.
A-2-148	Allegheny Ludlum Steel Corp. ....		"Warehouse Stocks" gives clear, concise and dependable list of stocks—Allegheny Ludlum High-speed and Tool Steels.
A-2-161	American Broach & Machine Co. Div., Sundstrand Machine Tool Co. ....	300	American SB-42-10 single ram broaching machine operates under push-button control. Completely automatic.
A-2-122	B. C. Ames Co. ....	58	Free copy of catalog suggests solutions to Quality Control problems.
A-2-126	F. E. Anderson Oil Co. ....		Free booklet "Lusol Gets to the Point" tells how to increase speeds and feeds and guarantees longer tool life.
A-2-133	Armour & Co. ....		Backstand belts give a better finish—outlast 4-5 set-up wheels. See booklet "How to Store Coated Abrasives."
A-2-118	Armstrong-Blum Mfg. Co. ....	49	Only MARVEL builds all four—hack sawing and band sawing machines, hack saw and band saw blades.
A-2-138	The Bellows Co. ....		Bellows-Locke drill unit combines hydraulic feed, air-powered traverse, electrically driven spindle.
A-2-215	Campbell Machine Division American Chain & Cable Co. ....	DH-260	Free bulletin offers hints on how to modernize your cutting procedure with time and effort reducing features of Campbell abrasive cutters.
A-2-147	The Carborundum Co. ....	10	Maintenance of alloy and high-speed cutting tools explained in new, free booklet.
A-2-208-2	Chicago Rivet & Machine Co. ....		Fasten "on the double" with the Chicago "214" double rivet setter. Speedy, economical.
A-2-134	Cleveland Instrument Co. ....		Speed and accuracy assured in production gaging with the "Par-ac." Free bulletin.
A-2-32	Cosa Corp. ....		Oerlikon production jig borer is rugged and rigid. Catalog gives full description.
A-2-211	Crucible Steel Company of America ....		Unique "Crucible Tool Steel Selector" selects the tool steel for your application.
A-2-197	The DoAll Company ....		Complete data and description of DoAll grinder design and construction given in new, free catalog.
A-2-23	Eastman Kodak Co. ....		Add Kodak High-Speed Camera to your engineering department and solve engineering problems. Free reprint of "High-Speed Photography in Design."
A-2-121	Engis Equipment Co. ....	T-253	For the right finish faster, from coarsest to finest, use Hypro compounds. More and lasting cutting power.
A-2-214	Galland-Henning Mfg. Co. ....	SW-1	Bulletin tells how Nopak cylinders may be actuated by manually operated or automatic valves.
A-2-17	Gisholt Machine Co. ....		Reprint "Static and Dynamic Balancing" from A.S.T.E. Tool Engineer's Handbook giving helpful information on balancing.
A-2-18	Gisholt Machine Co. ....		Simplimate Automatic Lathe catalog describing full information and specifications. Illustrated. Presents job facts.
A-2-20	Gisholt Machine Co. ....		"Wear and Surface Finish" book offers facts and cost-saving information on Super-finish.
A-2-113	Gorham Tool Co. ....		Free, 120-page catalog contains valuable engineering information; gives profitable solutions to production milling problems.
A-2-115-1	Graymills Corp. ....		Get more production from machines with Graymills. New catalog shows selection chart—tells right pump or coolant system for the job.
A-2-208-3	Grobet File Company of America, Inc. ....	HC1	Six staggered cutting edges on Chatterless Countersinks give a shearing cut and eliminate all chatter.
A-2-10	Hannifin Corp. ....	180	Hannifin "Hy-Power," the modern, cold-squeeze riveting method—fast, safe, quiet.
A-2-112	The Hisey-Wolf Machine Co. ....	72ED	Bench type Drill Grinder will quickly pay for itself in increased production and lower cost.
A-2-209	Illinois Tool Works ....		Illinite standard cutting tools—engineered for production efficiency—available through leading distributors.
A-2-114	Industrial Diamond Association of America, Inc. ....		Information booklet, "The Diamond That Pays for Itself," available.

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A-2-120	The B. Jahn Mfg. Co. ....		Production runs increase, set-up time is slashed, individual press operations are eliminated with B. Jahn progressive dies.
A-2-106	Keller Tool Co. ....		Free 36-page booklet gives information and interesting ideas on air tool application.
A-2-12	Lapointe Machine Tool Co. ....	B-5	When you need broaches, look to the leader—look to Lapointe—50 years in broaching.
A-2-131	Ladding, Inc. ....		Free catalog shows 365 items that can save time and money on jig and fixture component parts.
A-2-162-3	Metal Carbides Corp. ....	52-G	Talide—the world's hardest metal. More durable than steel. Triples output per man and per machine.
A-2-166-2	W. F. Meyers Co., Inc. ....	13	Increase production, save time and money on your drilling operations with Meyco carbide inserted bushings.
A-2-98	Micrometrical Mfg. Co. ....		Two new free bulletins give suggestions on your needs in roughness measurement and practical operating features of the Profilometer.
A-2-201	Miller Motor Co. ....	A-105 H-104	Free bulletins describe unique advantages of complete Miller cylinder line.
A-2-123	Morton Machine Works ....		Morton fixture clamps and fixture details save tool and design costs; assure quality and service.
A-2-208-4	Newage International, Inc. ....	ET412	Portable, metal hardness testers, available in Rockwell "A," "B," "C," "15N," and Brinell scales.
A-2-20	Niagara Machine & Tool Works ....	89	Bulletin describes high-speed press brakes, 50-ton series for fabricating sheet metal and light plates.
A-2-223	Oakite Products, Inc. ....		Three booklets offered with valuable information and data on metal cleaning, paint stripping and electroplating.
A-2-34	The Ohio Crankshaft Co. ....		Minutes saved means dollars earned. Many operations eliminated through the use of Tocco's time and cost-saving methods.
A-2-107	O'Sell-Irwin Mfg. Co. ....		Di-Aero precision machines for Die-less duplicating. New catalog and bending manual offer new ideas and methods.
A-2-174	Parker-Kalon Corp. ....		P-K socket screw bulletin—16 pages—describes all types, lists sizes, and illustrates quality control back of P-K guarantee.
A-2-170	R & L Tools ....		"Precision Workmanship Speaks for Itself." R & L tools guaranteed not to bend or give way.
A-2-208-1	J. A. Richards Co. ....	TE-5	Multiform Big Brother Bender produces without special tooling; saves die costs and on expensive presses.
A-2-123	The Sentry Co. ....	G-4	Efficiency, economy, quality in Sentry heat-treating.
A-2-228	Sheffield Corp., Murchey Div. ....	MU-1052	New Murchey 4-in-1 self-opening die head cuts machine screw threads, cuts pipe threads. Lower cost per thread.
A-2-100	Simonds Abrasive Co. ....	ESA-181	Sharpen your carbide tools the economical way with Simonds grinding wheels.
A-2-176	Standard Pressed Steel Co. ....		Strength, accuracy, uniformity, displayed in Unbrako flat head socket cap screws. "Unbrako Standards" available upon request.
A-2-97	Stocker & Yale ....		Brand new Optical Comparator Brochure outlining 10 Optical Gaging Problems and a brief basic instruction course in Optical Projection Methods offered free for the asking.
A-2-173	D. A. Stuart Oil Co. ....		Time-tested cutting fluids and lubricants described in copy of "More than a Coolant Is Needed."
A-2-184-1	Swarts Tool Products Co., Inc. ....	941	Standard drill jigs a capital investment. Lower subsequent tooling costs.
A-2-132	Tomkins-Johnson ....	8152	T-J dependability, strength, economy, versatility, long life all assured with use of T-J air cylinders.
A-2-202-1	U. S. Hoffman Machinery Corp. ....	A-690 A-915	Vac-u-matic filter renders high flow rate, self-cleaning dry sludge, keeps coolant cool, complete, compact.
A-2-198	Van Keuren Co. ....	35	Catalog and handbook available without charge. Contains complete information regarding use of Gear Measuring wires.
A-2-217	Waldes Kohinoor, Inc. ....		New Waldes Truarc E-ring Dispenser brochure shows how to speed assembly, cut time and costs.
A-2-108	Wendt-Sonis ....	53	Complete details and specifications for the W.S. line of standard carbide tools listed in new catalog.
A-2-124	S. B. Whistler & Sons, Inc. ....		Adjustable, magnetic custom and cam dies for all industry. New, fast, proven, low-cost methods reduce die costs.

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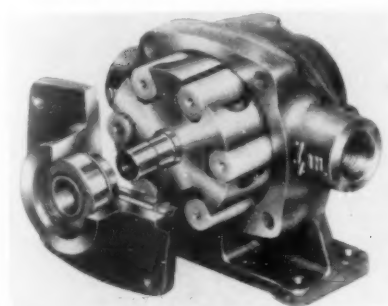
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## Roller-type Pump

An 800 rpm roller-type pump designed for belt and pulley or direct drive operation on electric motors or gas engines has been developed by Hypro Engineering, Inc., 404 No. Washington Ave., Minneapolis, Minn.

The pump is a junior model of the Hypro 750 and utilizes the same design at lower capacities.



Named the 6000 series, the pump is specially adapted to handle wettable powder mixtures as well as emulsified solutions. It is recommended by the manufacturer for a wide variety of spraying and transfer jobs. The unit is instantly self-priming, will deliver approximately 12.5 gpm open discharge at 800 rpm with recommended pressures to 200 lb.

It features Ni-Resist case and rotor with tough, resilient nylon rollers for positive liquid displacement and long life. Permanently lubricated ball bearings and stainless steel shaft insure smooth, continuous operation under heavy usage.

The pump has 3/4-inch pipe connections and can be mounted directly on a truck or tractor PTO shaft; it is furnished with base plates and solid shaft for gas engine and belt and pulley drive. For PTO use, sleeves and hub adapters are available in various shaft sizes. Pump weight is 10 1/2 lb.

**T-2-1031**

## Level Control

An electronic level control has been developed for nonconductive materials ranging from condensed gases to semi-solids. It incorporates many late developments in electronics and has proved extremely valuable for precise level control, particularly in the high temperature and high pressure ranges where exacting level controls are desired.

The KTROL, as it is called, is a compact unit with plug-in, sealed housing containing all components. The plug-in unit can be replaced in a matter of seconds. Exchangeable sealed component units are available for insertion in control without disturbing or removing equipment from tank or vat.

It is so designed that the electronic circuit will maintain level control from plus or minus 1/16 inch and up. Custom-built noncorrosive probes are available for the material to be controlled and the kind and size of tank or container to be used. The KTROL is available in an oil-filled housing making it acceptable for explosion-proof installation.

The manufacturer says the control can be easily installed in the field without adjustment and will maintain its accuracy. Since the unit is completely sealed and gasketed it is not affected by humidity or temperature. There are no moving parts in the material to be controlled. It operates from a standard light circuit. There is less current used in the control circuit than in a thermo-couple. Information can be obtained from the Greylor Co., 605 W. Washington Blvd., Chicago 6.

**T-2-1032**

## Overload Relay

An overload relay combining extremely high-speed operation under dangerous conditions with time delay for starting inrush has been introduced by the Heinemann Electric Co.

The type C Silic-O-Netic relay can be furnished with time delay curves to match the characteristics of the protected equipment. Since it provides a definite high-speed response point at eight times rating, however, it fulfills need for protecting hermetically sealed motors, electronic circuits and control systems. These applications require fast protection at relatively low overload values.

Operating on the Silic-O-Netic relay principle, the relay has a hermetically sealed brass tube extending through and beyond the solenoid coil. The tube, in turn, holds a movable iron core and is filled with a silicone liquid. On starting inrush or small overloads, the magnetic force is not sufficient to attract the armature. It does, however, draw the core into the field at a rate controlled by the viscosity of the silicones. When the core reaches the pole piece the relay responds, providing delayed response. On large overloads the core is not a factor and relay operation is instantaneous.

The overload relays are insulated for 440-volt service with coil ratings from 1 to 100 amperes. They are furnished in tamper-proof phenolic housings with an overall weight of only 6 oz.

Further information is provided in bulletin 5101 available from Heinemann Electric Co., 517 Plum St., Trenton 2, N. J.

**T-2-1033**

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*The Finest in Quality Reamers*



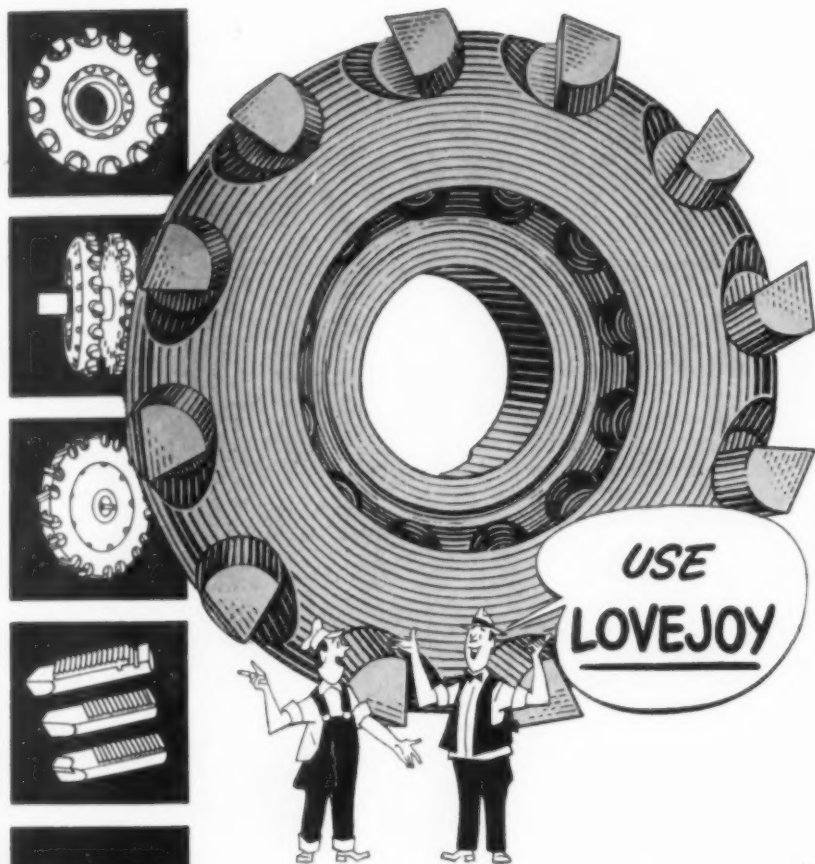
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**LAVALLEE & IDE, INC.**

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INDICATE A-2-103





## ...the word from the wise in milling cutter circles

The modern Lovejoy line of inserted-tooth milling cutters are ordered and reordered on the basis of performance. Proof? . . . our first customers are still with us after 30 years of satisfaction.

The modern Lovejoy line has never been more complete. Improved new designs, both standard and special, are coming constantly from our large engineering staff.

The modern Lovejoy line features the exclusive "positive-locking" device to allow maximum use of each blade and minimum loss in sharpening.

The modern Lovejoy line of milling cutters, boring tools, arbors, flywheels, etc., plus outstanding field service, can help you cut your production costs, just as it has for others.

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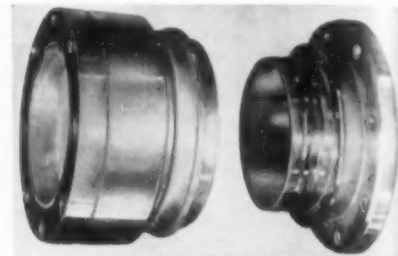
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TOOL COMPANY, INC.

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FOR FURTHER INFORMATION, SEE READER SERVICE CARD; INDICATE A-2-104

### Snap-Tite Coupler

A Snap-Tite coupler for an 8-inch pipe line has been announced. It is standard flanged connections, a valve in the coupler body automatically shuts off the liquid flow when the male part, or nipple is removed. The coupler is also offered without a valve. It is made from forged steel, bronze or practically any type of material depending on end use.



The quick connect feature eliminates the necessity of having a maintenance man with tools available for connecting or disconnecting; any operator can make or break a connection by merely sliding a sleeve on the coupler.

Couplers are made from 1/4 to 8 inches. In sizes up to 3 inches inclusive, the couplers are designed for screwed fittings, male or female, and over 3 inches with screwed or flanged fittings. All couplers swivel 360 degrees, eliminating hose kinks. Cross threading is impossible.

Made by Snap-Tite, Inc., Union City, Pennsylvania.

T-2-1041

### Toggle Clamps

Eight toggle-clamp models are announced by Lapeer Mfg. Co., Lapeer, Mich. They are of the plier type with five of them having horizontal handles and three with vertical handles. All have long, thick, flat bases with extra base plate optional.

These clamps were developed to provide a new type of equipment to toolrooms demanding individual clamps having greater thickness capacity. The PJP series represents a clamping range from 1 11/16 to 6 15/32 inches with throat capacities of 1 1/4 to 2 1/4 inches. The PJC series represents a range from 3 15/32 to 6 15/32 inches with throat capacity of 2 1/4 inches.

In each type of clamp the base plate is available in either of two ways: in soft metal so that it can be adapted to particular needs, furnished with two bolts for attaching, or in hard metal, already installed, including parallel jaw, measuring one inch in thickness.

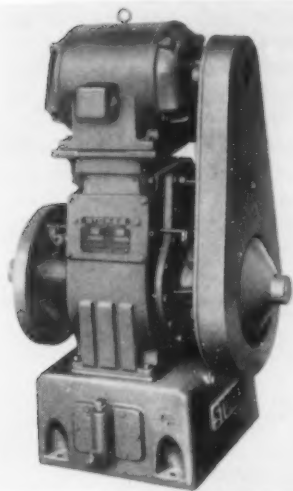
The spindles, adjustable for height, have nuts to lock them in desired working positions.

T-2-1042

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Vacuum Pump

General engineering improvements have been incorporated in the production of a Microvac pump, model G, by the F. J. Stokes Machine Co. This pump is used diversely for high vacuum evaporation of metals and metallic salts, for evacuation of electric light bulbs, for high vacuum sealing of containers, etc.



New features of the pump include a modern type of shaft seal installed to minimize maintenance. There are no stuffing-boxes, no valves, no adjustments. Lubrication is completely automatic, and freedom from leakage is guaranteed. New valve-stops prevent the copper-beryllium springs from reaching coil-to-coil compression at any time. These stops also permit use of the high-vacuum pumps in a broad range of applications including rapid cycling evacuation of large-volume systems.

The side-entrance intake acts as a baffle action against entering solids; additional protection is afforded by a new screen filter. For cleaning, every part of the pump is easily accessible. An oil filter in the line to the shaft seal gives special protection to bearings at these points. A new solenoid valve in the oil supply line automatically prevents oil-flooding of the pump and vacuum system in the event of power failure. The Microvac pump, Model G, is manufactured by the F. J. Stokes Machine Co., 5500 Tabor Road, Philadelphia 20.

T-2-1051

## Pedestal Tool Grinder

This pedestal tool grinder comes with either 8-inch grinding wheels and a  $\frac{1}{2}$ -hp motor or with 10-inch wheels and a  $\frac{3}{4}$  hp motor. Compactly built, it measures 49 $\frac{1}{2}$  inches high, 18 $\frac{1}{2}$  inches wide and 20 $\frac{1}{2}$  inches deep.

There is no bulky motor between the wheels. The open space around

each grinding wheel permits the operator to do his work faster because his arm movements are never cramped. Since the motor is mounted in the pedestal, it is protected from abrasive dust. Moreover, this design feature removes the weight of the grinding wheels from the motor bearings. The grinding wheel spindle runs on sealed ball bearings which, combined with the fully enclosed V-belt drive, produces a quiet, vibration-free running condition.

The grinding wheel spindle is set forward on the pedestal to provide even more workroom around the grinding wheels. This offsetting of the spindle also allows more toe room for the operator while standing at the machine.

Large eye shields provide optical protection at each wheel. Because the

safety glass shields are of such size, the operator need not raise the shield in order to see what he is doing. Two concealed lamps in each shield give light for freehand precision grinding. Wheel guard castings are extra thick for operator safety and their large dust outlets permit hooking into a dust exhaust system. Added operator protection is provided by close-fitting spark guards within the wheel guards.

Minor features are the larger size waterpot which is removable for cleaning, push-button motor switch located at waist level and the U-shaped tool rests adjustable to any angle and also adjustable for wheel wear.

For information write to South Bend Lathe Works, 425 East Madison St., South Bend 22, Ind.

T-2-1052



# ADJUSTAFIX

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Practically universal adjustment. 2 to 8 spindle, standard. Also specially designed heads.

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Keller Tool Company, Grand Haven, Mich.

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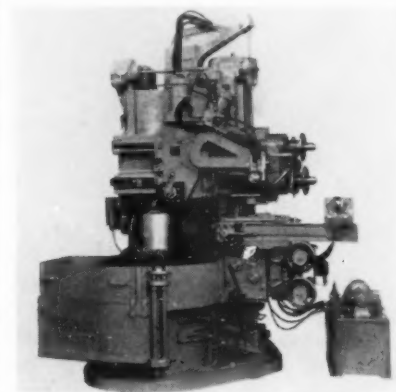
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-106

## Duplicating Attachment

A development of particular interest to manufacturers of jet engine parts is this Turchan vertical slide hydraulic duplicating attachment applied to a Niles sidehead lathe. This combination increases contouring capacity of the machine to do contour turning of greater height, as well as deeper contour boring.

The vertical slide, powered by a hydraulic cylinder, operated from a control panel, gives infinitely variable feed rates plus rapid travel. The cutting tool is moved to produce the desired shapes on the work by means of the hydraulic cylinder controlled by the contour follower valve in contact with the templet. Micrometer adjustments permit accurate positioning of contours on the workpiece.



The four-way turret tool block allows rough and finish cuts to be taken without altering adjustment of the contour follower. Grooving tools can also be used in conjunction with the vertical slide; the depth of groove being controlled by adjustable positive stops on the slide.

The range of parts that can be produced faster with accuracies of  $\pm 0.001$  inch include jet engine wheels, compressor discs, shroud rings, impellers and other circular components. Many contours not ordinarily capable of being developed can be duplicated rapidly through this vertical slide movement.

The Turchan equipment puts the machine on practically an automatic basis, eliminating need for skilled help, and also cuts setup time to a small fraction of former methods and saves costly rejects, it is claimed.

The attachment is integral with the Niles sidehead vertical lathe, or can be obtained to fit any other make of standard machine. Further information is available from Niles Tool Works, Hamilton, Ohio, division of Lima-Baldwin-Hamilton Corp., or from Turchan Follower Machine Co., Detroit 4.

T-2-1061



## Vapor Degreaser

The Wallace DG-1 degreaser is a production unit, portable, electrically operated, insulated and thermostatically controlled.

Provided with either a 110 or 220-volt heating element, it is ready for instant plug-in operation. Heat-up time is less than 20 minutes, and requires only 2½ gal of solvent. The manufacturer's noninflammable Xsol solvent vaporizes at a higher moisture-dispelling temperature, and this, coupled with a hot-dip galvanized steel tank, practically eliminates rusting and corrosion problems common with water-cooled units, it is claimed.



The caster-mounted base and plug-in features make portable operation practical, permitting use of the unit at different work stations. The thermostatic control maintains a constant vapor level and prevents overheating.

Engineering has provided for attachment of a flusher pump, lip-vent, 21-inch-diameter work-baskets, and other accessories required on some degreasing applications.

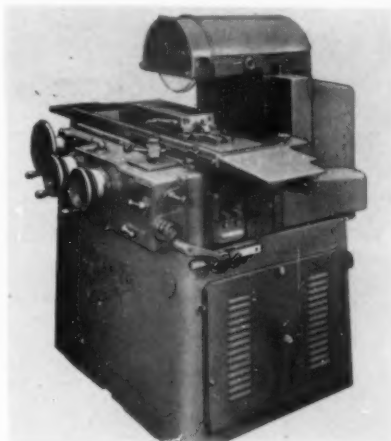
For bulletin write to J. D. Wallace and Co., 134 S. California Ave., Dept. C. Chicago 12.

**T-2-1071**

## Grinding Machine

The Scrivener 8 x 18 inch super-surface grinding machine, model 9102/2, is distributed in this country by Kelvin Systems Corp., 135 Front St., New York 5, is noted for ease of control, and is capable of meeting the most stringent requirements of the toolroom from the standpoint of accuracy. At the same time, due to its massive construction and proved bearings, it is capable of continuous and heavy stock removal on production work. The machine gives a satin-smooth finish.

The wheel is larger than customary, and the nitralloy spindle on which it is mounted is of extra large diameter, with its bearings and lubrication system complete. Plain bearings are used. The bearings have a built-in adjustment for wear.



The table takes a full-size vise, and all movements, cross-feed or vertical adjustment of the wheel head, can be effected by hand or power, greatly facilitating setting-up. The wheel dressing device is included as standard equipment, permitting the wheel to be dressed in a matter of seconds, without disturbing the work in any way. The table is long, provided with suitable water channels for wet grinding and with T-slots for work-holding fixtures.

The column is a heavy casting, carried on well-lubricated vertical ways, and actuated by means of an oversize leadscrew with antifriction thrust bearings for the special rotary nut. Power rise-and-fall is included as standard equipment, this power movement operating to within a half-inch of the total rise, at which point a limit switch is operated, cutting out the power feed and leaving the column to be manually operated for the last half-inch of travel. This prevents any possibility of damage through inattention or carelessness in operation. Collapsible guards cover the ways in all positions of the head.

The grinding machine is normally supplied for dry grinding, but if required for wet grinding, coolant tank with independent motor driven pump, piping, fittings and splash guards can be supplied as extra equipment.

**T-2-1072**

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## PRECISION MACHINES

for Die-less Duplicating

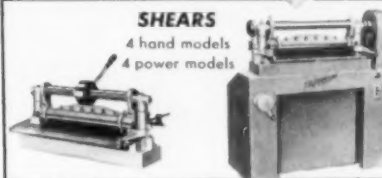
### BENDERS

5 hand models  
2 power models



### SHEARS

4 hand models  
4 power models



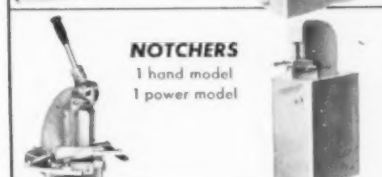
### ROD PARTERS

2 hand models  
1 power model



### NOTCHERS

1 hand model  
1 power model



### PUNCH PRESSES

2 hand models  
2 power models

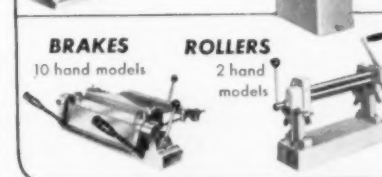


### BRAKES

10 hand models

### ROLLERS

2 hand models



### NEW CATALOG

packed with ideas for making parts by "Die-less Duplicating"—the money-saving, time-saving technique created by Di-acro.



**BENDING MANUAL** gives exact methods for bending processes in a variety of materials. Over 90 diagrams and charts with suggestions.

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375 8th Ave., Lake City, Minnesota

INDICATE A-2-107

**This Standard  
WENDT-  
SONIS  
tool  
saved  
35%  
on one application!**



#### THE PROBLEM

Finishing a 19" motor rocket body chucked with a rubber expansion arbor. The rubber expansion arbor made use of a coolant impossible. A high speed steel tool was tried but proved ineffective because no coolant could be used. Resulting high cutting temperature dulled the high speed steel almost immediately. Special carbide tools were being tried, but costs were high and delivery slow.



Harold Shelley  
Ann Arbor, Mich.

#### THE SOLUTION

Harold Shelley of Gransden-Hall Co., Wendt-Sonis distributor in Ann Arbor, Mich., solved the problem. He recommended standard Wendt-Sonis BR-86 carbide tipped tool bits modified from a 15° to a 25° cutting angle. These Wendt-Sonis tools, taken from the distributor's stock, cut production costs and effected an overall saving of 35 per cent on the entire job.

#### WENDT-SONIS WILL SAVE YOU MONEY

Be sure you have the RIGHT tool for the job! You'll find that only Wendt-Sonis offers a complete line of dependable, precision carbide tools for every cutting application. All Wendt-Sonis Carbide-Tipped Tools have rust-resistant tool shanks made from highest quality steels for greater economy and faster production.

#### NEW! 1953 ILLUSTRATED W-S CATALOG

Write today for the new Wendt-Sonis illustrated catalog, number 53. Contains complete details and specifications for the W-S line of standard carbide tools. You'll find this a helpful source for selection of the proper tool for every tool application.

**WENDT SONIS**

HANNIBAL, MISSOURI

580 N. Prairie Ave.,  
Hawthorne, California

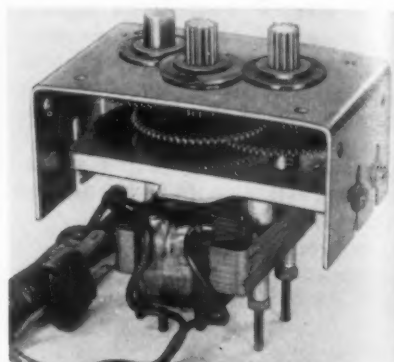
549 West Randolph St.  
Chicago, Illinois

"THE MOST COMPLETE LINE OF CARBIDE CUTTING TOOLS"



#### Small Motors

A range of midget electric motors with multi-purpose gear trains has been developed by General Die and Stamping Co., 262 Mott St., New York 2. The motor series comprises seven models semienclosed with bracket, and one which is of the open type.



These geared motors are designed for a wide variety of speeds and applications. The motor itself is the same throughout, a shaded pole, induction-type unit with self-aligning, oil-retaining bearings. They operate on 110/120 volts ac, 50/60 cycles, and at low and medium speeds they have great torque. Electric consumption is no more than 15 watts.

The Kasson Roto-Sho midget electric motors are equipped with tough fibre and metal gears, oversize brass pinions and heavy shafts. Plates are of heavy gage steel for rigidity and strength.

The gearing can be supplied with single or multiple shafts which permit use of any one or combination of a number of speeds from 1 to 1150 rpm. Shaft diameter is  $\frac{7}{16}$  inch, while the dimensions are  $3\frac{1}{4} \times 4\frac{5}{8} \times 3\frac{1}{4}$  inches.

T-2-1081

#### Flame-Resistant Curtains

Impregnated, flame-resistant canvas curtains and blankets that can be hung to form inexpensive booths to screen off dangerous operations are now being offered by Eastern Equipment Co., Inc., Willow Grove, Pa. The curtains and blankets afford complete protection for workers near arc welding and other operations where arc flash, molten splash flying chips, scale, etc. are produced. Curtains are made to individual requirements from 8, 10 or 12-ounce duck and from Underwriters' grade asbestos cloth in sizes to over 100 square feet. They contain sturdy, firmly fastened brass grommets a foot apart on one long side. All edges are hemmed and seams are double row stitched for added strength. The blankets are made with grommets in each of the four corners. Additional grommets can be furnished where required on either the curtains or blankets.

T-2-1082

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-108

## Electric Impact Wrench

Mall Tool Co. offers their model 4EW Mark-Hammer. The housing is die cast aluminum alloy; there is a pistol grip with detachable side handle, a built-in trigger switch with locking pin, ball and needle bearings, heavy-duty gears, forced draft ventilation for



cool running and a heavy-duty reversible universal type ac-dc motor for 115 or 230-volt current. This electric impact wrench has a net weight of 16 $\frac{3}{4}$  pounds, a spindle speed of 1800 rpm. The hammer is mounted on antifriction bearings for prolonged smoother operation. It handles up to  $\frac{7}{8}$ -inch nuts and bolts. Write Mall Tool Co., 7725 South Chicago Ave., Chicago 19, for further information. **T-2-1091**

## Indexing Centers

South Bend Lathe is now marketing their indexing centers. This device is designed for small precision work and can take stock up to 5 inches in diameter and 6 inches in length.

Ideal for dividing operations such as machining splines, flutes and gears, it is a useful tool for milling, shaping and grinding squares, hexagons or odd angles. Accurate cross-drilling also can be held to close tolerances with indexing centers.

Equipped with graduated collar, a ball crank and worm gear turn the head center. Each graduation indicates a center movement of three minutes while a complete turn of the ball crank revolves the center five degrees. An easily read dial on the worm wheel is graduated 360 degrees. For quick positioning of the center, the worm gear can be disengaged and a clamping device locks the head center in any desired position. As an added feature, the plunger type tail center with automatic spring tension permits removal of the work without disturbing the head center. A knurled thumbscrew securely locks the tail section while work is in progress.

Complete specifications may be had from any South Bend distributor or by writing direct to South Bend Lathe, South Bend 2, Ind. **T-2-1092**



"Looks like someone swiped another one of Pete's Columbia Molite Cutters!"

**COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.**

Producers of fine tool steels—High Speed Steels  
Die Steels—Hot Work and Shock Resisting Steels  
Carbon Tool Steels.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-109-1

## New "PRESTALLOY"

## PROFILE DIAMOND DRESSERS

- ★ ECONOMICAL
- ★ VERSATILE

The new "Prestalloy" Dresser is truly an economical tool. Diamonds mounted in the matrix are completely used up and no further setting is required. This results in greater diamond utility at the lowest possible production cost. This new design gives industry a versatility which is preferable to the single point diamond in that they will dress every type and size of grinding wheel in use today.

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Eugene Roth, Inc.  
New York 19, New York  
Hudson Tool Service  
Fort Wayne 5, Indiana  
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SEND  
FOR  
CATALOG

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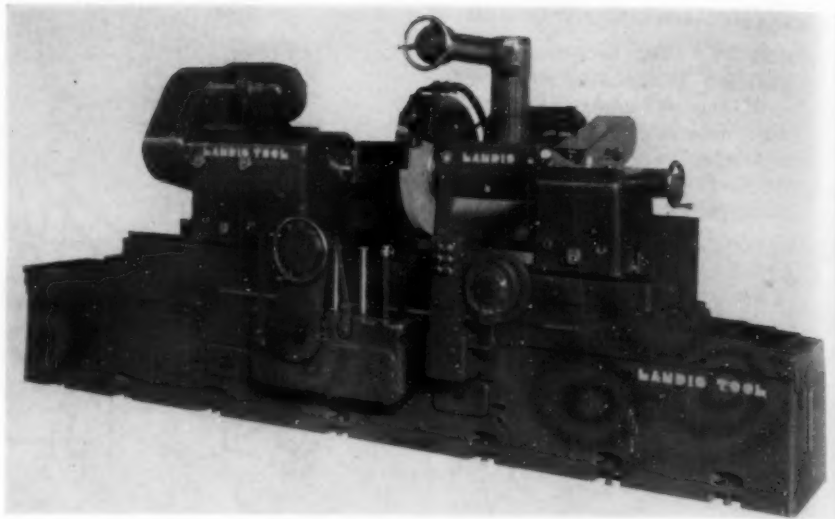


## Plain Grinder

A line of plain grinders for large diameter workpieces has been developed by the Landis Tool Co., Waynesboro, Pa. This machine is identified as the CHW plain grinder. It is available in 30, 36 and 48-inch diameter swings. Lengths between centers are 48, 72, 96 and 120 inches.

Parts such as turbo-jet engine rotors, track carriers, large diameter motor armatures, water valves and similar parts of large diameter, or with projections, can be handled on these machines.

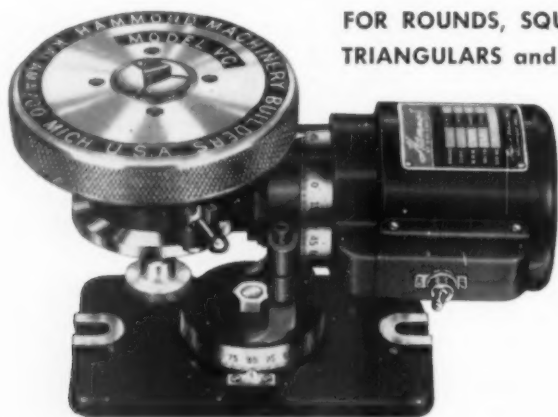
Previous to the development of this line, large diameter pieces were ground on standard machines with raised centers, or on heavy-duty machines that would accommodate these sizes. The



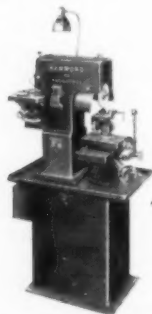
*Hammond* OF KALAMAZOO  
GOOD MACHINERY SINCE '82

## FAST ACCURATE GRINDING of SOLID CARBIDE INSERT TOOLS

FOR ROUNDS, SQUARES,  
TRIANGULARS and RECTANGULARS



MODEL VC, Style M Motorized Solid Carbide Insert Grinding Fixture. Style H, without motor also available. Write for Bulletin No. 701.



HAMMOND MODEL CB-77 CHIP BREAKER AND DIAMOND FINISHING GRINDER can be supplied with both the standard Any Angle Vise and the Model VC Solid Carbide Insert Grinding Fixture.

**T**HE Hammond Solid Carbide Insert Grinding Fixture pays for itself in a few weeks. Offers a fast, economical and accurate means of grinding chip breaker grooves in round, square, triangular and rectangular shapes and for rough and finish grinding of dull and damaged carbide inserts. Motorized Style M with lug base can be mounted on most tool and surface grinders and Hammond CB-76, CB-77 and CB-77W Chip Breaker Grinders.

BUILDERS OF AMERICA'S MOST COMPLETE  
LINE OF CARBIDE TOOL GRINDERS

*Hammond Machinery Builders* INC.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-110

type CHW has bridged this gap and provides a precision cylindrical grinder of the correct size, engineered to grind work accurately and efficiently.

A 10 or 15-hp motor is used to drive the 30-inch diameter grinding wheel. Selection of the size drive motor depends on the type of job to be ground. Variable speed headstock drive is standard but constant speed is available.

The slide under the wheelhead is a double type to allow for the large amount of base movement required on machines of this kind. The slide is manually positioned, but can be supplied with power operation. The slide-ways, as well as the work carriage ways, are pressure-lubricated with filtered oil from a separate reservoir.

Carriage ways have increased spacing to provide stability when grinding large diameter work for which this machine was designed. The hydraulic table traverse is adjustable to any desired speed between 3 and 130 inches per minute. The swivel table may be adjusted to grind tapered work.

The wheel spindle runs in Landis Microsphere bearings. These bearings have a spherical outer form, are babbit-lined, one-piece steel bearings which may be quickly and easily adjusted for clearance. They operate with extremely small clearance between spindle and bearing, giving an accurate response to wheel feed changes as well as a quick, positive spark-out.

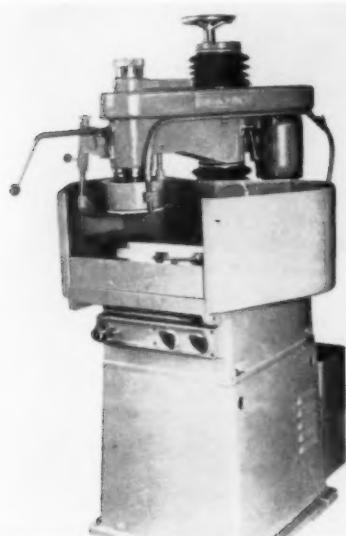
Eye level wheel feed is used for the adjustment of wheel head position. This enables the operator to watch the grinding action from the same position from which he adjusts the wheel.

T-2-1101

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Grinding Machine

This surface grinding machine uses a vertical spindle and cup wheel. The work is placed on the table or magnetic chuck and the cup wheel is passed rapidly over the work by hand for rough grinding. A hydraulic feed is then engaged for finish grinding. This results in a tremendous output as compared with the standard horizontal spindle machines.



Vertical adjustment of the spindle is by means of a large handwheel. The fine adjustment is by a large-diameter graduated drum reading in 0.0004 inches. The machine uses 7½-inch diameter standard Norton cup wheels. A diamond dresser is attached directly to the wheel housing so that it is instantly available for dressing the wheel. The machine comes equipped with pump and piping for wet grinding.

For further information, write to George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y. T-2-1111

## Drilling Machine

A machine which drills 32 holes of 3/16-inch diameter in a steel part at the rate of approximately 120 pieces (3840 holes) per hour has recently been announced by the Govro-Nelson Co., 1933 Antoinette, Detroit 8.

The machine incorporates 8 model HH Govro-Nelson automatic drilling units, electrically interlocked with automatic, hydraulically operated clamping and indexing.

In operation, the operator places the part on a fixture and presses the start-cycle switch. The part is automatically clamped and 8 holes are drilled simultaneously at each of the four indexes, thus completing the 32 holes. Then the part is automatically unclamped.

T-2-1112

February, 1953

# One press stroke -no more!



## TRIMS SHELLS COMPLETE

### Assures Clean, Flat Edges

Slow, costly, multiple "horn" operations, and distorted edges due to "pinch" trimming can be eliminated by a Brehm Die. Operating on principles different than ordinary trimming methods, the Brehm "Shimmy" Die with angular cams causes the shearing edges to cut *four ways* in a *single* press stroke.

Materials, thickness, shapes and sizes look alike to a Brehm "Shimmy" Die. Whether it's stainless or mild steel, copper, brass, zinc, gold, fiber, silver, aluminum, rubber or plastic, Brehm users are assured of precise production

results. Shapes can vary widely, whether a watch case, artillery case, refrigerator door, automotive or aircraft part. Clean, flat, burr free edges are assured. Edge contours can be straight or curved, with multiple notches and projections.

When model changes alter the part design, or if you wish to handle an entirely new part, you only need to substitute cutting adapters.

Write today . . . for a free catalog. Find out what a Brehm "Shimmy" Die can do—submit blueprints, or the part for full information or quotation.



## Brehm

### TRIMMING DIES



BREHM DIE DIV., DEPT. 1, SPRINGFIELD, OHIO  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-111

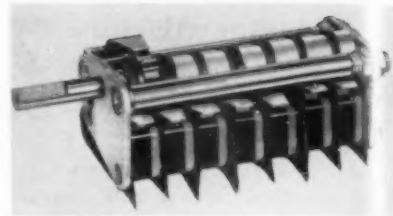
## Switch Assembly

A series of extremely small-size multiple rotary switch assemblies, designed especially for aircraft use but adaptable to a wide variety of either a-c or d-c switching applications, is announced by Micro of Freeport, Ill., a division of Minneapolis-Honeywell Regulator Co.

One of the most popular of the series is a ganged assembly of seven Micro V3 type basic switches with single-pole, double-throw contact arrangement. Each V3 basic switch measures only  $1\frac{3}{32} \times \frac{3}{8} \times 1\frac{1}{32}$  inches, and the entire assembly measures  $1\frac{1}{2} \times 1\frac{5}{8} \times 4\frac{3}{4}$  inches.

In its initial use as an aircraft cockpit lighting control of multiple circuits, this assembly has been found to have exceptional resistance to vibration. The pivoted cam followers accurately maintain their adjustment. The detent mechanism provides a positive feel at each position. Cam combinations can be used to give any desired sequence of circuit control or switching arrangement.

The d-c rating of the assembly for inductive and heater load is: 30 volt—10 amperes at sea level; 30 volt—6 amperes at 50,000 feet altitude. The a-c rating for inductive and heater load is: 125 or 250 volts—10 amperes. Current



ratings are based on a maximum permissible temperature rise of 65 degrees C. Inductive load ratings were determined by using AN3179 inductors.

Other variations of the assembly are available in from to eight gang assemblies of V3-type single-pole double-throw basic switches and from two to eight switching positions at 45 degrees angular rotation between positions.

Applications of the new series, in addition to lighting control, include aircraft landing gear indicators, X-ray and electronic equipment and aircraft electric windshield wipers. **T-2-1121**



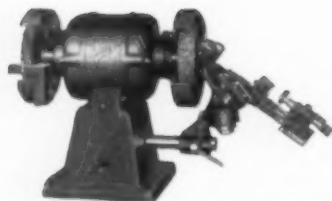
Drill Grinder with  $\frac{3}{8}$  inch capacity holder on left and  $2\frac{1}{2}$  inch on right side. Can also be furnished with a general purpose grinding wheel on left end instead of the small drill holder. Also available for wet grinding.

## A POINT TO REMEMBER

A drill point that is sharp and correctly ground will—

- (1) drill to exact size
- (2) drill faster
- (3) drill more holes per grind
- (4) require less power
- (5) reduce breakage
- (6) cost less to regrind
- (7) increase life of drill as less metal is removed each time drill is sharpened.

It naturally follows that a Drill Grinder will quickly pay for itself in increased production and lower cost direct and indirect labor.



Bench type Drill Grinder with  $\frac{3}{8}$  inch capacity holder. Also made in  $1\frac{1}{4}$  inch capacity Pedestal type.

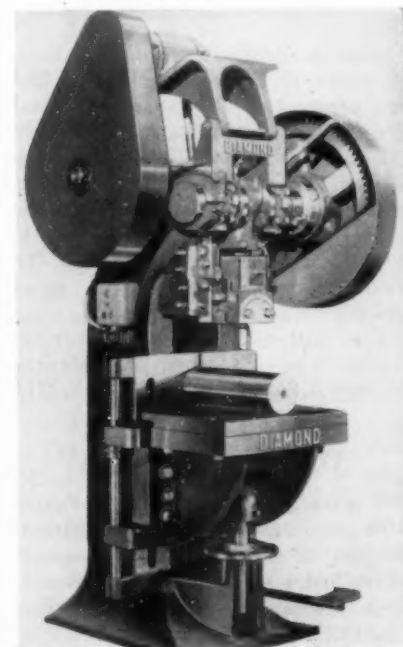
**Write for catalog 72 ED today!**



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-112

## Horn Press

The Diamond Machine Tool Co., 5111 Coffman-Pico Rd., Pico, Calif., has announced a 40-ton horn press, featuring a heavy-duty frame and ease of adjustment, the press is manufactured either plain or geared.



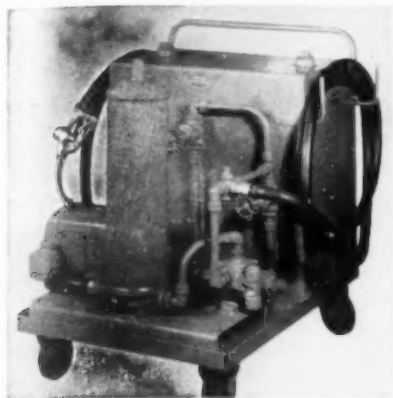
Specifications are: diameter of shaft at main bearings,  $3\frac{1}{2}$  inches; table area of bolster, 18 x 24 inches; opening in bed, 10 x 14 inches; horn hole and length, 6 x 19 inches; die height, table to ram, 6 to 18 inches; die height, center of horn hole, 8 inches; bolster thickness, 2 inches; stroke, standard to maximum, 3 to 6 inches; ram adjustment, 2 inches; ram area, 7 x 8 inches; strokes per minute, 50 to 100.

**T-2-1122**



## Portable Filter Unit

Portable hydraulic filter units that are used for pumping hydraulic oil from a machine through the filter and back into the machine or into tanks for transport or storage are designed and



built by J. N. Fauver Co., Inc., 49 West Hancock, Detroit 1. The equipment consists of: a Fauver portable tank, one 55-gallon section, and one 20-gallon section; Fauver hose assemblies; Cuno filter; Yale and Towne model 20 pump; Parker fittings and tubing; Brown drip-proof nozzle; Crane valves and three-way cock;  $\frac{1}{2}$  hp motor.

**T-2-1131**

## Masonry Drill

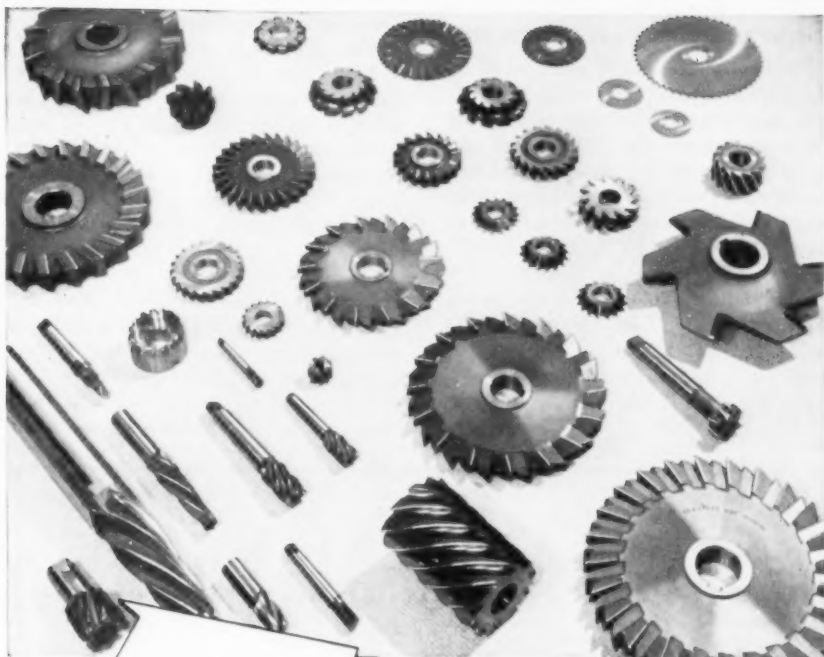
Dust packing which causes stalling is overcome by the design of a masonry drill being introduced by Holub Industries, Inc., Sycamore, Ill. It is claimed that the drill, called Hi-Twist, can be used for continuous drilling of concrete, stone, brick, and similar masonry materials, as well as copper, brass and other soft metals.

The secret of dust removal is in the proper combination of oval flutes, narrow lands and spiral which carries the dust up and out of the hole as fast as it forms. As a result, less pressure is required and drilling can continue to desired depth without once removing drill to clean the hole. The drill can be used with any tool.

The Hi-Twist drill is made of a very tough alloy steel and has a Carboloy tip which resists dulling. The cost is comparable to other carbide-tipped drills. Other advantages claimed are longer drill life and reduced drilling costs.

Sizes range from  $11/64$  to 1 inch for spiral fluted drills and  $1\frac{1}{8}$  to  $1\frac{1}{2}$  inches for straight fluted drills. Individually the drills are packed in a protective plastic tube. They are also available in handy roll kits of three and four sizes.

**T-2-1132**



# GORHAM

## END MILLS AND MILLING CUTTERS

For profitable solutions to production milling problems, call on Gorham! Over thirty years' experience in creating fine cutting tools is your assurance of satisfaction.

An extensive line of *standard* end mills and milling cutters is stocked by Gorham distributors. When you need *special* tooling, a Gorham Field Engineer surveys your problem and makes design recommendations for a tool to be "tailor-made" for your application by skilled Gorham craftsmen.

Ask your distributor for Gorham "standards." For "specials," call in your nearby Gorham Field Engineer. They're both well qualified to help you . . . and backed by unmatched experience and facilities. For profitable solutions to milling problems, call on Gorham! There's no obligation.

Write for free 120 page catalog. Shows entire line, contains valuable engineering information.

## Gorham TOOL COMPANY

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WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-113



## Sharpening Attachment

The peripheral and end teeth of straight shank end mills from  $\frac{1}{8}$  to  $\frac{3}{8}$ -inch diameter are quickly and easily sharpened using this attachment designed for use on No. 5 cutter and tool grinding machines. Its sensitive, free-turning spindle is of especial advantage when sharpening very small end mills having steep spiral peripheral teeth. In operation, the tooth being sharpened is held in contact with the tooth rest while feeding the cutter across the wheel by longitudinal table movement. A small knurled diameter at the end of the draw-in bolt gives extremely

sensitive control of the work.

The attachment spindle is carried in a body that is fastened to the motor head furnished with the machine. This permits setting to an angle in both horizontal and vertical plane with rigid clamping provided for both adjustments. Two opposed zero marks and a scale graduated in degrees provide for settings in a horizontal plane to 90 degrees in either direction. A scale graduated in degrees to 20 degrees each side of zero provides for settings in a vertical plane. Zero marks 180 degrees apart on the spindle body provided for sharpening both right-hand and left-hand cutters. Adjustable clearance gage



at end of spindle, for use when sharpening peripheral teeth, has two scales 180 degrees apart that read to 20 degrees each side of zero by degrees. Provision is made for mounting tooth rest on either top or bottom of attachment body. Spindle is mounted on ball bearings. Has No. 7 B & S taper hole. Spindle can be clamped by means of thumbscrew. Can be swiveled end for end. End mills of various sizes are accommodated by stock spring collets regularly available. A draw-in bolt (threaded,  $\frac{3}{8}$  inch 16 N.C., R.H.) is furnished for use with the spring collets. **T-2-1141**

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IDA-1

INDUSTRIAL DIAMOND ASSOCIATION OF AMERICA, INC.  
124 E. 40th St., New York 16, N. Y.

## Dry Lubricant

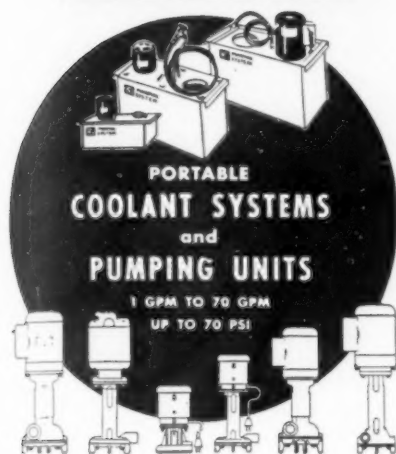
A dry lubricant for use in metal-forming operations is announced by Gilron Products Co. Known as Drawcote, this lubricant offers a radical departure from ordinary compositions, procedures and practices. When applied to metal and dried thereon, it is said to form a dry, protective and lubricating film. Once coated, stock can be stored for long periods, then used as desired without any reapplication or additional lubricant. Drawcote is easily removed from formed parts by a hot, mild alkali bath.

The manufacturer states that Drawcote can be applied three ways to the clean surface of any rough or highly polished surface. Stock can be dipped in a hot aqueous solution, solution can be sprayed on, or the solution can be flowed on over the surface.

Being a dry lubricant, Drawcote is said to eliminate oil films, smut, etc. in subsequent painting or vitreous enameling processes. It is claimed that it reinforces the coarse tooth and protects the high porosity of vitreous enamel stock so that the stock can be easily formed, cleaned, dried and enameled without further treatment.

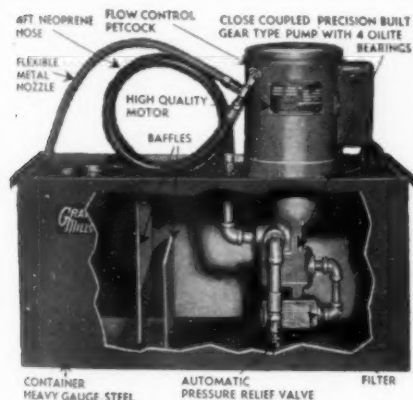
Drawcote has no fumes nor odors and is noninflammable. A powder, it is shipped in wooden barrels ready for mixing with water. Complete information can be obtained upon request to Gilron Products Co., 6007 Euclid Ave., Cleveland 3. **T-2-1412**

Get More Production  
from your Machines  
with



PROPER application of coolants mean increased production and time and tool savings. You can have these advantages for every machine—small, large, and special—with Graymills Portable Coolant Systems.

They can be installed in a few minutes, are modern in design, and of heavy duty construction with built-in automatic pressure relief valve on gear pumps.



Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to 1/2 HP ratings, 1 gal. to 70 g.p.m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.

MOST INDUSTRIAL DISTRIBUTORS STOCK STANDARD UNITS.

WRITE FOR NEW CATALOG SHOWING SELECTION CHART TELLS THE RIGHT PUMP OR COOLANT SYSTEM FOR THE JOB.



**GRAYMILLS CORPORATION**  
3729 LINCOLN AVENUE • CHICAGO 13

INDICATE A-2-115-1

February, 1953

## Form Tooth Slotters

Gay-Lee Co., Clawson, Mich., announces the development of a method by which they are now able to supply their Thinsaws with contour tooth forms.

This enables users to employ carbide with its longer life and higher speeds in cutting slots that require a form and where it has been necessary to use steel cutters in the past.



A wide variety of convex forms, including radius and radius with angles tangent and their variations, can be produced to customer specifications at reasonable cost.

Thinsaw carbide tips are brazed into a circular pocket, an exclusive Gay-Lee feature, which provides a better brace and assurance that tips will not come loose. They are available in diameters up to 8 inches and in thicknesses of 0.030 inch up. Gay-Lee solid carbide saws are available from 0.020 inch up. Either type can be produced with contour tooth forms so that proper re-sharpening does not destroy the contour. **T-2-1151**

## Water-Type Coolant

A water-type coolant that contains wax, for use in metalworking machines that use water-soluble coolants, has been developed in the industrial research laboratories of S. C. Johnson & Son, Inc. The product is called Johnson's #130 Wax-Cool.

Tests have proved that the Johnson wax development has exceptional lubricating properties and minimizes heat at its source. These characteristics of Wax-Cool extend tool life and provide a better finish on metals.

The product was formulated after two years of research in the Johnson's Wax Laboratories. It is a wax-fortified water emulsion and provides the same wax advantages that industry has experienced with Wax-Cut. Johnson's oil-type coolant containing wax.

Wax-Cool is sold as a concentrate and should be mixed with 20 parts of water before use. The product is packaged in 30- and 55-gallon drums and is now available through Johnson's industrial products distributors. Further information can be obtained from the Industrial Products Department of S. C. Johnson & Son, Inc., Racine, Wis.

**T-2-1152**



Are you interested in saving up to 50% in your inspection time, also extending for many years the useful life of expensive gage blocks?

The above is being accomplished in many of the largest manufacturing companies in the country by the use of the Pioneer Tool gage block jack.

Designers and manufacturers of tools, dies, gages, fixtures, special machines, optical checking equipment and precision instrumentation parts.



**PIONEER TOOL & ENG. CO.**

3914-18 W. Shakespeare Ave.

Chicago 47, Illinois

INDICATE A-2-115-2

115





AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

Do Your Jobs

**EASIER-  
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**FLEXIBLE  
SHAFT  
MACHINES**

**TAPPING ATTACHMENTS  
TAPS • FLEXIBLE SHAFTS  
AND MACHINES  
ROTARY FILES  
TUNGSTEN CARBIDE  
REAMERS AND MILLS  
DRILLS • BORING BITS**

*Jarvis*  
**POWER  
TOOLS**

Whether your operations call for GRINDING, CUTTING, BUFFING, or ROTARY FILING, Jarvis Flexible Shaft Machines will do your jobs Easier — Faster and more economically.

Available in Bench, Floor or Overhead types — in Single or Multiple Speeds to suit your individual requirements.

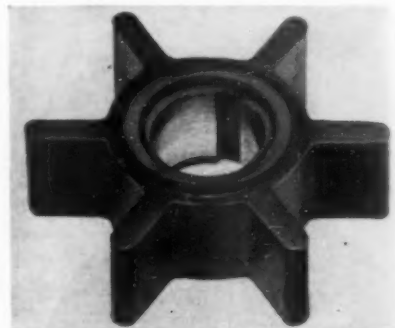
Jarvis Factory trained representatives are ready to assist you select the Machines you need. For further information and Catalog of Jarvis Flexible Shaft Machines, write directly to The Charles L. Jarvis Company, Middletown, Connecticut.

**THE CHARLES L. JARVIS CO.  
MIDDLETOWN IN CONNECTICUT**

FOR FURTHER INFORMATION USE READER SERVICE CARD: INDICATE A-2-116

## Rubber-Metal Bond

A special process that bonds natural, synthetic or silicone rubber to metal allows parts with metal cores to be ground concentric to tolerances 0.002 inch. This cannot be done with rubber alone. Nuts and bushings of



rubber and metal can be tightened without breaking, where plastics and fibers would break or leave marks. Metal can now be used in many rubber items where rigidity as well as resiliency, is required.

Further information may be had from Advance Rubber Co., Inc., 1702 Washington Ave., Minneapolis 15.

**T-2-1161**

## Density Gage

These density gages offer a simple direct method of measuring many unusual process variables, where density is a function of the measurement desired, it is claimed. The penetration power of radioactivity is employed in the system to make possible measurements heretofore considered impractical or impossible because of such conditions as high temperatures or pressures, or corrosive or erosive elements. Liquid level and interface liquid level, surface films, specific gravity, unit weight per unit area, gas or liquid composition are a few of the variables that can be measured with accuracy and sensitivity by this null system of measurement. Many installations can be made without the need of any connections to process piping or vessels whatsoever. Basis for the density gage is the Ohmart cell, in which radioactive energy is converted directly into electrical energy, thus eliminating any need for a high-voltage power supply. For further information request bulletin 10454, from the Ohmart Corp., 2347 Ferguson Road, Cincinnati 38.

**T-2-1162**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Dipping Tanks

Globe Imperial Corp., 2023 Kishwaukee St., Rockford, Ill., has announced a complete line of production dipping tanks for Plastic Seal hot dip protective coatings. Five standard models in the line range from 8 x 4 x 6 inches up to 13 x 6 x 18 inches, according to the manufacturer.



Because of the positive agitation created by the impeller-type agitator, and special heating elements which radiate heat to the sides of the tank, an oil jacket is unnecessary, allowing more rapid heating and cooling. Positive agitation eliminates surface congealing caused by ambient air, maintains transparency and color over longer periods, and gives a constant level in the dipping area for mechanical conveyor dipping operations. The impeller overload switch automatically shuts off the impeller when necessary. **T-2-1171**

## Electric Controller

An electric contact controller for solenoid valves, warning signals and motors has been announced by the H. O. Terice Co., 1420 W. Lafayette Blvd., Detroit 16, Mich.

Vapor-actuated, the controller is designed to stand a fairly heavy electrical load. A feature of the controller is a red and green pilot light to show at a glance the position of the switch.

Standard controllers operate on 115 volts ac. When specified, controllers can be furnished for currents up to 250 volts ac or dc. **T-2-1172**

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February, 1953

# Jarvis SOLID TUNGSTEN CARBIDE TOOLS

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MIDDLETOWN IN CONNECTICUT

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## Ventilated Buff

A self-ventilating buff which enables faster buffing and reduces buff wear is known as Ruff-L-Buff.

When two or more are combined to make up a buffing wheel, ventilating air enters the wheel through holes in the fibre-board centers of the buffs. As the wheel rotates, centrifugal forces drives the air through twelve channels between each buff to the cloth portions of the buff where numerous ruffles distribute the air over the buff side and channel it on through the wheel, cooling as it goes.

This makes it possible to operate

wheels at higher speeds and to apply greater pressure between the work and the wheel. The net result is faster buffing with less buff wear. The ventilating feature also results in the use of less buffing composition as the composition binder is not volatilized through excessive heat.

Cloth used in making the buffs is cut diagonally to the threads. This "bias construction" exposes to the work the maximum number of thread ends, thus getting more cutting action per revolution. Since cloth cut on the bias does not ravel, buffs wear longer, and also, there is less lint, which means that less buffing composition is wasted since less



of it is discarded with lint.

Other features of the buff are perfect balance for uniform rotation and wear, steel-ring anchor to secure the cloth to the fibre-board center, and a face which takes composition immediately without the necessity of evening the buff surface and impregnating it with composition.

The buffs are available in standard and heavy-duty weights with outside diameters of 12, 14, 16 and 18 inches.

For further information write to the Hanson-Van Winkle-Munning Co., Matawan, N. J. for bulletin B-100.

T-2-1181

## Only MARVEL builds all four\*

While it is true there are several builders of hack sawing machines and many builders of band sawing machines, only MARVEL builds BOTH hack saws and band saws. The fact is that MARVEL manufactures 35 models of 10 basic type of metal sawing machines which include the world's fastest automatic production saw, the world's largest giant hydraulic hack saws, the world's most versatile band saw and the most widely used small shop saws.

With intimate and broad field experience in all types of metal cutting-off equipment and 35 different saws available, it is obvious that MARVEL Field Engineers occupy a unique and exclusive position in the industry. They are eminently qualified to make expert and unbiased recommendations covering the type, size and model of metal sawing equipment best suited to individual requirements—that most efficient, most accurate, fastest, broadest in scope and the most economical.

MARVEL is also the only manufacturer of both metal sawing machines and metal sawing blades. Because the efficiencies of both the machine and the blades are interdependent, each upon the capability of the other, expert knowledge covering both saws and saw blades is essential to the proper appraisal of any specific sawing situation. Correct balance of cutting speed and blade life, feed pressure and blade tension are all potent factors in over-all performance. Here again it is the MARVEL Field Engineer who is qualified to provide the comprehensive answer to your question. His job is to help you saw metal most efficiently—his services are available upon request—gratis.

\* HACK SAWING MACHINES

\* BAND SAWING MACHINES

\* BAND SAW BLADES

\* HACK SAW BLADES

WRITE FOR CATALOG 49  
**ARMSTRONG-BLUM MFG. CO.**  
5700 Bloomingdale Ave., Chicago 39, U.S.A.



FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-118

## Portable Lathe

The Barrett portable lathe, model B-23, is a completely self-contained unit, semiautomatic in operation after the initial simple setup is made. Ten speeds from 0 to 45 rpm are rheostat-controlled by a dial. Infinite feed controls and other features can be adjusted while the lathe is in operation.

This portable lathe head travels as it revolves on a boring bar arbor. The tool arm, adjustable for diameters from 7½ to 20 inches, remains fixed in relation to the head. The speeds and feeds of the machine are limited only by the material of the workpiece and the cutter which may be either high-speed steel or carbide.

Design of the lathe permits either the external or internal machining of a circular workpiece, up to 20 inches in diameter, by simply reversing the toolholder and installing the current type of cutting tool. Modern construction with the main work arbor mounted on Timken roller bearings and a worm reduction positive gear-driven feed mechanism running in oil assure smooth, quiet operation.

Made by Barrett Equipment Co., Industrial Div., 2101 Cass Ave., St. Louis 6, Mo.

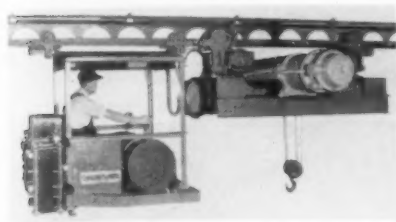
T-2-1182



## Tramrail Carrier

An overhead traveling carrier equipped with a hydraulic cell scale has been built by the Cleveland Tram-rail Division of The Cleveland Crane and Engineering Co., Wickliffe, Ohio. This permits weighing all loads handled, quickly and easily.

The hydraulic cell is operated by a lever to which is fastened the upper hoist block. Resulting pressure is transmitted from the cell to the scale dial by hydraulic tubing. The scale weighs in pounds or kilograms.



The motor-driven tramrail carrier has a travel speed of 300 fpm. The hoist has a speed of 38 fpm and a lift of 36 feet. Both travel and hoisting motors are provided with variable-speed controllers; in addition, the hoisting controller is designed for dynamic lowering. Load capacity of this unit is three tons.

Careful consideration has been given to safety. A safety switch is provided in the cab and the travel motor is equipped with a foot-controlled electric brake. Also incorporated into the carrier is a weight-type limit switch which permits the operator to travel only when the load block is in high position. This assures clearing through openings of limited dimensions along the travel route safely. A screw-type limit switch is also provided for limiting the distance of travel when lowering.

Variations of this unit can be designed to accommodate other loads, speeds and lifting distances as conditions dictate.

T-2-1191

## Oil Mist Control Unit

A redesigned Precipitron oil mist control unit that will recover the coolant oil from the mist and smoke generated by high-speed cutting, grinding, milling, and similar machining operations is available from Westinghouse. This redesigned oil mist control unit is available in two models: type PO-6 and PO-12. PO-6 has an air-handling capacity of 600 cfm, PO-12 of 1200 cfm.

Salvage or recovery of coolant oil is only one of the benefits made possible by this oil mist control unit. Others are: (1) a reduction in such industrial hazards as slippery floors, fire hazards, reduced illumination, and contaminated atmosphere; (2) savings in heating costs up to \$300 a year per unit by not exhausting usable heated

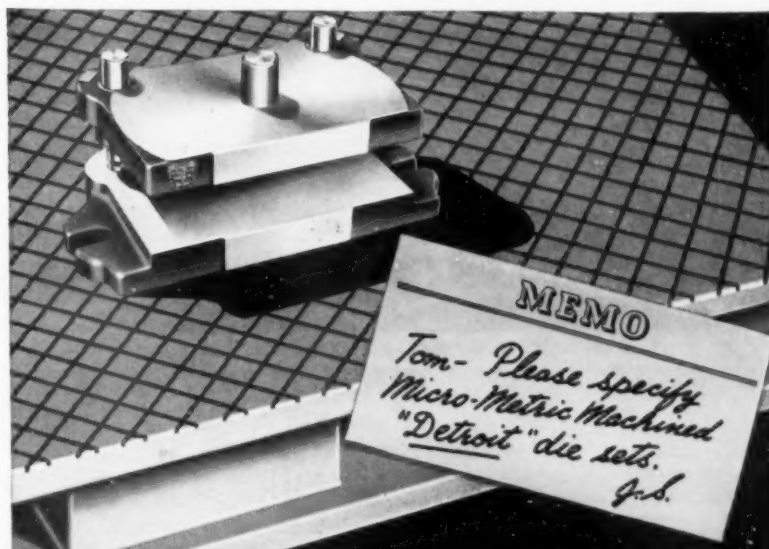
or conditioned air; (3) improvement in employee attitude that comes from working in clean surroundings; (4) reduction in building maintenance costs such as structural members, windows, lighting fixtures, heating ducts, steam and water pipes; machine tools and floors will not be coated over with a greasy film.

The Precipitron oil mist control unit is completely self contained: the heavy gage sheet-steel cabinet houses the all-aluminum oil-particle charging and collecting elements with their high voltage power pack; the motor-driven fan; duct connection; and oil sump. The unit is shipped factory assembled and tested, ready to be floor mounted

or ceiling suspended near the machine.

The fan motors are three-phase, fractional horsepower, ball bearing, prelubricated, totally enclosed, for 220-or 440-volt service. The power pack operates from a single-phase, 115-volt line and consumes less than 60 watts when operating. The PO-6 is 55 inches high, 22 inches wide, 24 inches deep, and weighs 265 lb unpacked. The PO-12 is 63 inches high, 31 inches wide, 27 inches deep, and weighs 390 lb unpacked.

For further information, write Westinghouse Sturtevant Div., Dept. T-509, 200 Readville St., Hyde Park, Boston 36, Mass. T-2-1192



"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

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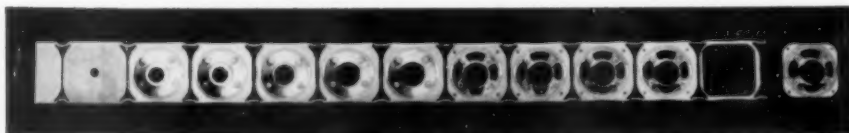
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# **B. Jahn** PROGRESSIVE DIES SAVE\* AMERICAN INDUSTRIES *Millions!*

Thousands of unnecessary, costly operations have been eliminated from America's production lines by B. Jahn! Actual die strip photographs illustrate intricate — seemingly impossible tooling problems overcome by B. Jahn's versatility and ingenuity.

Production runs increase — set-up time is slashed — individual press operations are eliminated — better die products result — for every B. Jahn built die is PRODUCTION PROVED to the customer's complete satisfaction.

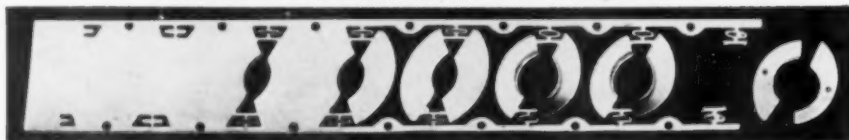
\*B. Jahn Progressive dies not only SAVE millions, they MAKE millions!



Die ribbon—11 station loud speaker housing



Die ribbon—7 station double wall bracket for glass shelf



Die ribbon—6 station fluid drive coupler

By running from 10 to 50,000 parts or complete assemblies for customer's production line use *before the die is delivered*, error is eliminated! guesswork ended! chance abolished! The die is certified PRODUCTION PROVED!

## SEND FOR THE FACT-PACKED "STORY OF B. JAHN PRODUCTION-PROVED DIES" NOW!

Read the many illustrated, money-making case histories! Find out how B. Jahn eliminates major tooling problems for engineers! See the many intricate die ribbons from B. Jahn Dies! Learn about the 165 skilled B. Jahn craftsmen and their ultra-modern facilities! Engineers, this is money-making must reading, send today!



*Investigate B. Jahn and Invest in Production Economy!*

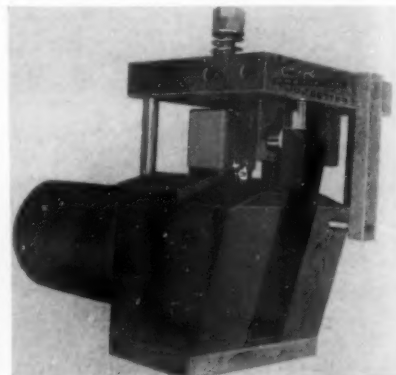


THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT  
FOR FURTHER INFORMATION USE READER SERVICE CARD; INDICATE A-2-120

## Tool Setter

A device known as the Micro in tool setter has been developed to reduce the time necessary to replace one or more tool bits on automatic turret. Because of the simplicity of the principle employed, highly skilled setup men are not required to operate the device.

It is a common practice, when replacing worn or broken tool bits, to adjust the new bit to a master part. Considerable skilled judgment must be employed to adjust to the right feel of the cutting edges against the master. Errors are made occasionally by even the best mechanics with resultant spoiled work.



The theory of the tool setter is simple and practical. After a setup is made, and a part is produced within tolerance, the tool setter is placed on the tool-holder, and is held on the holder by a permanent magnet through spring pressure, eliminating any clamping distortion. Three-point positioning legs allow for any irregularities in the tool-holder.

Gage pins are then brought into contact with the cutting edges of the toolbits. These pins are then locked with set-screws and the tool setter is removed with the exact tool position locked to the pins. The tool setter is then placed on a surface grinder and the back ends of the pins are ground flush with the face.

The setscrews are backed off and the pins allowed to float, providing permanent and accurate means of measuring the tool location.

To reset a toolbit, the tool setter is placed on the toolholder or boring bar. The toolbits are advanced until the cutting edges contact the floating pins. Adjustment is made until the back ends of the pins are flush with the face plate. This is done by feel on a rough cut or with a dial indicator on a finish cut. The toolbits are secured and the tool setter removed.

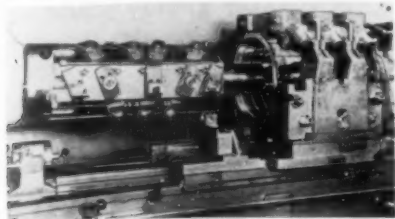
Made by Arnold C. Gayne Associates, 670 State St., Bridgeport, Conn.

T-2-1201

The Tool Engineer

## Boring Machine

A machine specially built for the complete machining of a jet engine compressor case has been developed by the Alfing Kessler Werke of Germany, and is available in the United States through Morey Machinery Co., Inc., 410 Broome St., New York 13.



The design is in two pieces. The boring bar is of rigid design with a temporary support during loading. The tool slides are mechanically actuated and hydraulically controlled.

Both halves of the housing are clamped in the fixture by a series of self-locking, spring-loaded blocks. The carriage then advances the work over the boring bar. The boring is inserted in an outboard support bearing and the temporary support is retracted. Cylindrical, tapered or combined bores, end faces, T-slots and other grooves can be machined. Boring bar design permits considerable adjustment for design changes.

**T-2-1211**

## Heavy-Duty Grinders

These heavy-duty machines, made in 18-, 36-, 48-, or 12-inch work lengths, perform plunge-cut and traverse grinding operations that require larger diameter or wider grinding wheels than are accommodated by the conventional type CTU cylindrical grinders.



The most important feature of the 10-inch type CTU-HD and 14-inch type LCTU-HD machines is the heavy wheel head with super-duty size pressure-lubricated wheel spindle for wheels up to 10 inches wide. The extremely high service capacity of this head, combined with rigid work-supporting units and smoothly-operating sliding components, assures fast grinding action with precision. Wheel feed is by revolving feed screw type of mechanism having a click-count index by which settings for 0.0001-inch work diameter reduction are made instantly and without visual attention.

Setup and operation are simplified by accessible placement on the front of the machine of all adjustments for feeds and speeds. Additional benefits in operating ease come from a preset truing and grinding table speed arrangement which permits presetting of these speeds and immediate selection thereafter of one or the other by movement of a combination table start-stop and selector lever. Continual resetting of these speeds is thus avoided. Work jogging control by means of a lever positioned at the operator's left hand is an additional feature.

Operation is further simplified by automatic control of work rotation and

coolant flow. Automatic adjustable wheel feed at table reversals with automatic resetting of the wheel head and separate dwell controls for each end of table travel are also furnished. Electrical controls are grouped in an elevated enclosure for protection against infiltration of foreign matter and for convenient inspection. A ramped outlet on the coolant tank eases tank clean-out, and a hinged wheel guard cover provides accessibility for wheel changes. The base ways are protected by efficient space-saving steel tape-type guards. For further information, write Norton Co., Worcester 6, Mass.

**T-2-1212**

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grading  
for the  
right finish  
faster**

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**High Precision  
DIAMOND  
COMPOUNDS**

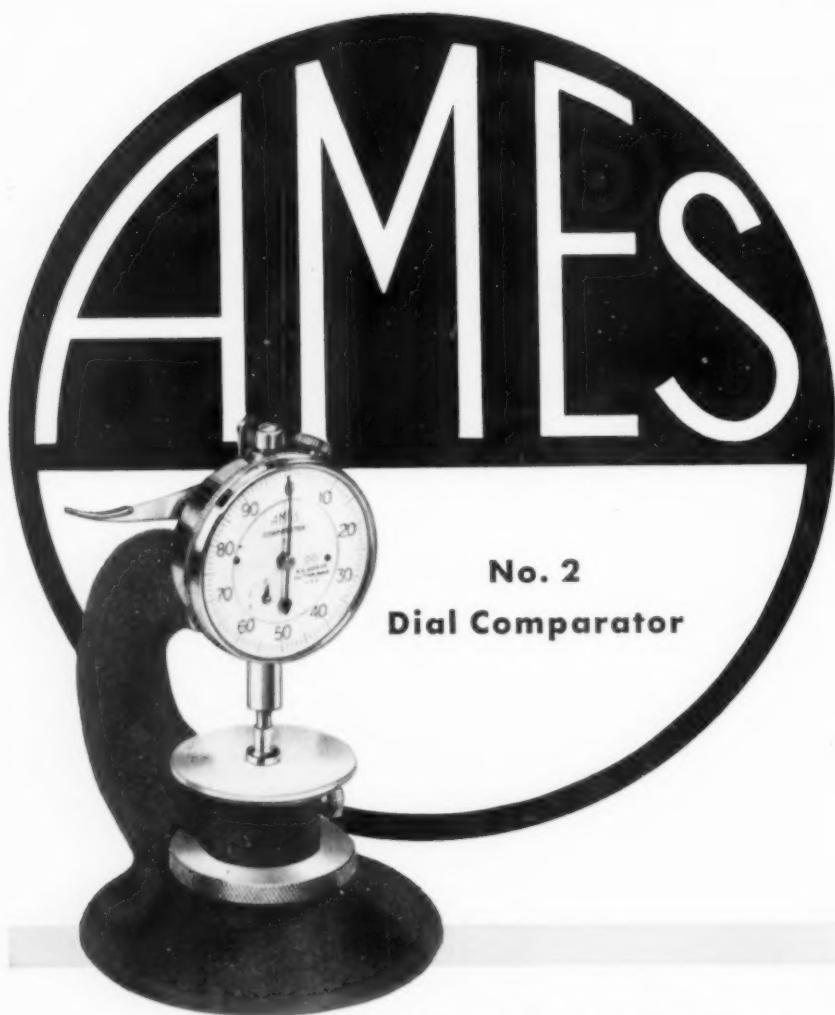
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431 SOUTH DEARBORN ST.,  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-121





**No. 2  
Dial Comparator**

This is smallest in the Ames' line of high quality dial comparators and it is ideal for desk or bench use in the fine inspection of small precision parts. It is light in weight, but its broad base makes it very stable. The capacity approximates that of the regularly supplied Ames No. 202 Dial Indicator which has a dial numbered 0-100, graduated in .001" and with a .250" range.

Should your job requirements differ, you can have the No. 2 with any Ames "Hundred Series" Dial Indicator. Send for Ames Catalog No. 58 covering the entire line of Ames

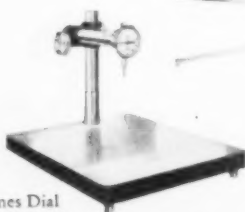
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## Balancing Device

The Taylor Dynamometer & Machine Co., Milwaukee, Wis., has announced a simplified and inexpensive unit for milling operations that are required to make corrections on piece parts that are to be put in balance. The unit was developed because of a demand for a simplified method of correction by



milling where removal of weight was required and drilling was not feasible. The arrangement consists of a milling attachment mounted on a sturdy, ground work table with coolant trough. The fixture for the piece part to be corrected is mounted on ways and moved against an end mill in the milling attachment. A manual feed screw with a graduated color for measurement of stock removal provides for a quick and simple operation.

This arrangement for correction of out-of-balance parts is fast and inexpensive. It is designed for use with the Taylor HI-EFF balancing machines.

**T-2-1221**

## Lubricant Additive

Molykote M-55, a colloidal dispersion of Molykote powder, highly purified and concentrated molybdenum disulfide, suspended in a synthetic vehicle compatible with any petroleum or sulphur base-cutting or lubricating oil, is announced by The Alpha Corp., 179 Hamilton Ave., Greenwich, Conn.

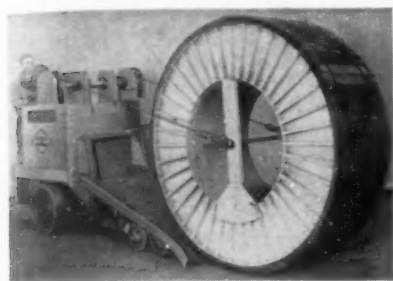
Molykote M-55 is said to be successful as an extreme bearing pressure additive to conventional oils in force-fed lubrication systems of machinery and as an additive to cutting and coolant oils whenever the frictional component is a substantial part of the total cutting force such as thread rolling and high-speed forming operations.

**T-2-1222**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Platform Truck

Designed for handling large reels up to 96 inches in diameter and weighing up to 20,000 lb, this platform truck is equipped with a rocking platform and a powered winch. The truck is manufactured by the Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3. Other models, designed for reels weighing 6,000, 10,000 and 12,000 lb are also available.



In operation, the truck is moved to a reel standing on the floor. Dual cables, connected to the powered winch on the vehicle, are attached to the pin running through the center of the reel. The winch is used to pull the heavy loads onto the rocking platform of the truck. As the roll strikes a horizontal bar located on the front of the battery compartment, power to the winches is automatically cut off.

Even when the reel is on the truck the rocking platform is always fixed in a slightly tilted position away from the truck so that when the cable is slackened, the reel rolls easily but safely onto the floor. Thus, the cable always controls the discharge of the reel, so that there is no danger of the heavy loads getting out of control.

The platform truck is available with either power or hand-wheel steer. The size of the platform and the wheel base may be varied depending on the diameter of the reel handled. The truck has all-wheel steering for maximum maneuverability and is powered by battery or a gas-electric unit. It is also equipped with a dead-man control.

**T-2-1231**

## Air Vise

Boyd Machine Co. announces the addition of a new model air vise which features a five-inch jaw and a maximum opening of 7½ inches. A sliding jaw is mounted on two hardened and ground bars. Cylinder pressure is transferred through the bars to the stationary jaw. This feature is said to eliminate strain in the base casting and to assure alignment of the cylinder with the sliding jaw.

With a pressure ratio of 20-to-1, this air vise develops up to 3000 lb holding pressure on a 150-lb air line. A hand operating valve is built directly into the cylinder. The cylinder is reported to be of special design with the exhaust from the pressure side of the piston utilized to return the sliding jaw. The manufacturer claims that all moving parts are precision fitted and that the jaw surfaces are machined square with the base to very close tolerances. Speed controls are incorporated in the cylinder so that the work motion of the sliding jaw can be slow or fast to suit the job. Valve control lever can be attached to drill press spindle or milling machine travel to allow automatic opening and closing of the vise with the return motion of the machine.

The cylinder is of the double acting

type featuring positive air return of the movable vise jaw which is said to eliminate stickiness due to chips or dirt during operation. Due to the cylinder and valve unit being completely sealed, conventional cooling fluids may be poured over the vise. Cylinder walls are solid ¾-inch steel and honed on the inside. The piston employs aircraft type neoprene O rings. A total of four conventional lugs allows the vise to be mounted on any type machine.

The Smith vise is distributed through Sandersen Sales Service, Hamden 18, Conn.

**T-2-1234**


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# SENTRY


*The Better Way  
To Heat Treat High Speed Steel!*

ALWAYS ON DUTY™

## GEOMETRIC Proves Sentry Efficiency



SENTRY MODEL YP  
Vertical model  
for long, slender  
drills, reamers  
broaches, etc.

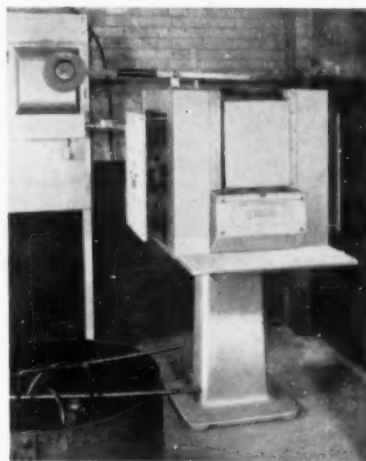


SENTRY MODEL 27  
For small tools,  
cutters of moly,  
tungsten and co-  
balt high speed  
steels.

Like many top industrial plants, GEOMETRIC TOOL COMPANY DIVISION, Greenfield Tap and Die Corporation, New Haven, Conn., had heard of the efficiency, economy and quality of Sentry heat treating . . . they decided to give a Sentry furnace a trial.

Again, as in so many instances, actual performance proved Sentry's claim of larger economy and high quality. Geometric is now using Sentry on a standard production basis.

**Request Catalog G-4**



Sentry Model Y Furnace at Geometric Tool Company Division, Greenfield Tap and Die Corp., New Haven, Conn.

**THE SENTRY COMPANY**  
FOXBORO, MASSACHUSETTS

INDUSTRIAL ELECTRIC FURNACES AND EQUIPMENT FOR HEAT TREATMENT OF METALS  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-123

122

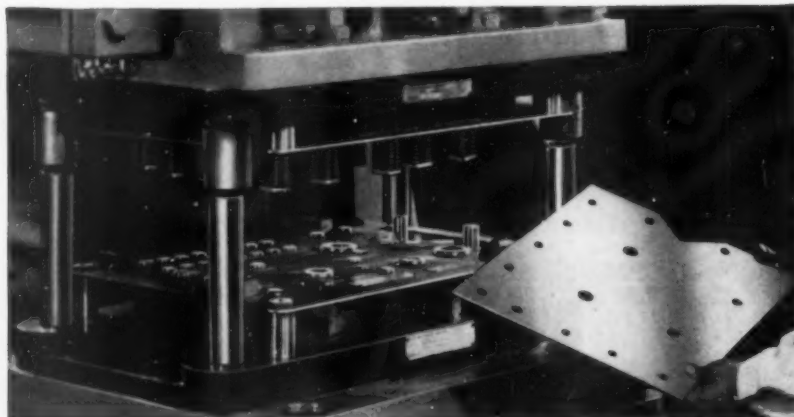
New • Fast • Proven

# LOW COST

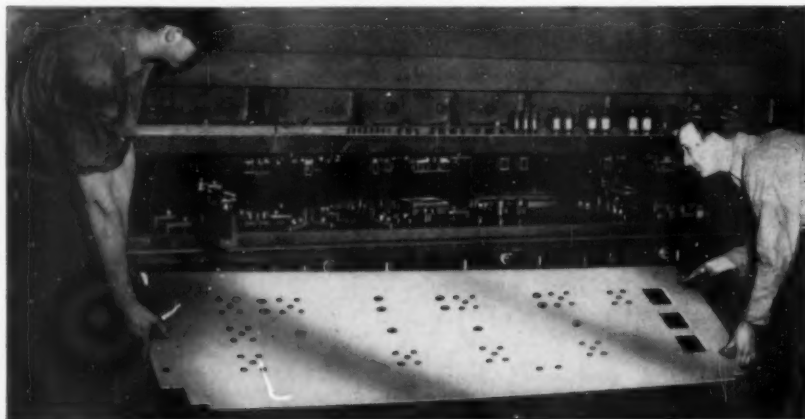
methods for  
PERFORATING  
and NOTCHING  
SHEET METALS

## REDUCE DIE COSTS

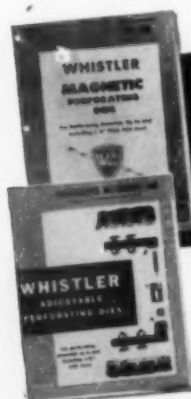
All units and parts are interchangeable and used repeatedly in different arrangements. **INCREASE PRESS PRODUCTION**—Down time is minutes as compared to hours for change-over. For precision work in all types and sizes of presses. **START PRODUCTION AT ONCE**. Pierce materials up to ¼" thick mild steel. Standard sizes and shapes available up to 3 inches. Special sizes to order.



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**Whistler ADJUSTABLE Dies** on perforating and notching job, using Tee slotted die set. With Whistler Adjustable Punch and Die units production starts within hours instead of weeks. Last minute job changes made quickly.



Here are the complete details with prices and application illustrations. Send for these catalogs. No obligation.

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Adjustable, Magnetic, Custom and Cam Dies for all Industry

744 Military Road, Buffalo 23, N. Y.

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## Electric Truck

Development of a 2500-pound capacity electric fork truck that travels at speeds up to 7 miles per hour and makes a U-turn in an 8½-ft aisle has been announced by The Baker Rauling Co., 1230 W. 80th St., Cleveland 2.

Called the FS-25, and designed to speed the handling of materials in manufacturing plants and warehouses, the truck is rated for loads up to 2500 pounds (48 inches long).

Important new design features of the FS-25 include a worm-gear driven power axle. Because it was specifically designed to be used under the low-speed high-torque conditions found in fork truck operations, worm gearing maintains its efficiency over much longer work periods than any other type. To fork truck users this means dependable tractive power, less maintenance, according to the company.



Mounted in rubber blocks to cushion twists and bumps, the trailing axle in the FS-25 allows the truck to step over uneven flooring and obstructions without upsetting the stability of the truck. Even with the truck's four wheels on four different surface levels, the truck chassis is perfectly level.

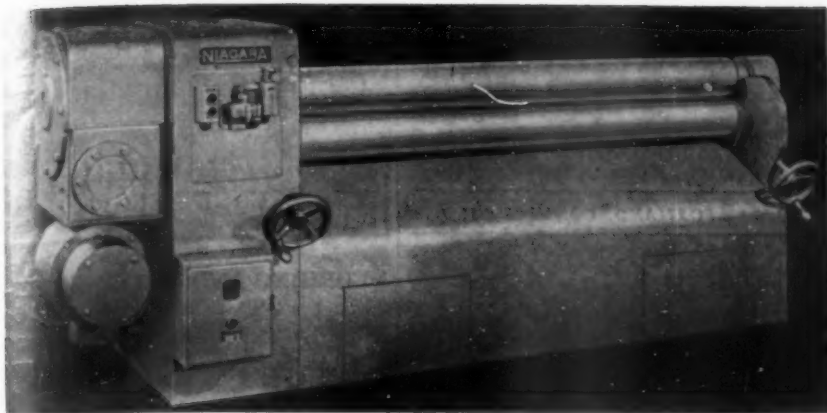
Dynamic braking was built into the FS-25 to prevent motor burnouts caused by sudden reversals of the truck's direction. Dynamic braking brings the truck to a smooth stop before direction can be reversed.

Heart of the FS-25 is a powerful motor designed and built by Baker. To make sure this motor will handle extreme overloads when it has to, it contains 30 percent more copper than is used in any other industrial truck motor on the market, it is claimed.

T-2-124

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION





### Bending Rolls

A series of all steel bending rolls has been announced by Niagara Machine & Tool Works, Buffalo, N. Y. They produce commercially true cylinders from thinnest sheets to maximum capacity and, in addition, can roll a multitude of bends in various shapes including oval forms, rectangular pipes, rounded end containers and cones.

They are of the pinch type construction which reduces flat spots on the leading and trailing edges of the work. Since all three rolls are power driven, light gage sheets can be readily formed into small diameters.

An air-operated drop end is controlled by a two-position valve. The upper roll automatically tilts for easy removal of the rolled cylinder.

Power adjustment for the rear roll allows the operator to quickly move the roll to proper position for producing any desired radius of curvature. Roll position indicators permit duplication of roll setting for repeat jobs.

A magnetic brake on the main motor prevents drifting of work, permits rapid reversal and positive jogging of rolls and gives the operator complete and accurate control at all times.

The rolls are made in three sizes, with capacities 5/16 x 48 inches, 3/16 x 72 inches, and 12 gage x 120 inches. They require no special foundation.

**T-2-1251**

### Hardness Tester

The Ernst superficial metal hardness tester permits on-the-job metal hardness testing without damaging the material or part. It gives direct dial reading in Rockwell 15N scale, 70-95. Accuracy is assured by individual assembly and individual calibration of each instrument against certified laboratory standards, according to the manufacturer.

The tester has a spring-loaded diamond penetrator indenter. Readings appear on a two-inch diameter scale. To take a hardness measurement, the hand-

grips are pressed downwards. This action lowers the indenter housing to bring the under surface of the tester against the surface of the material to be tested. After which, further depressing of the handgrips insures that the point of the indenter penetrates the surface of the test material under the action of the calibrated helical spring. The movement of the indenter as it penetrates the material slightly compresses the diaphragm of a fluid-filled chamber. Fluid is thereby forced further into the capillary tube, which encircles the dial, to indicate the hardness number on the dial scale.



The movement of the indenter into the material is magnified about 3,000 times by the fluid displacement in the capillary tube. The final position of the fluid indicates the hardness value directly on the scale. Maximum indentation is 0.003 inch and maximum diameter of penetration is 0.006 inch.

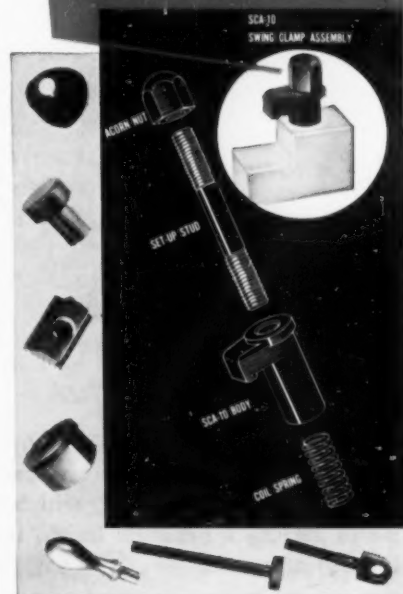
Ernst testers are available in Rockwell A, B, C, 15N scales and Brinell low and medium scales from Newage International, Inc., 235 East 42 St., New York 17.

**T-2-1252**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

*Specify*  
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**FIXTURE  
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FIXTURE  
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MACHINE WORKS**

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INDICATE A-2-125

# Production News

ABOUT *Lusol*. —THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY, INC. • PORTLAND, CONNECTICUT

## USERS' ENTHUSIASM FOR *Lusol* SPREADS FAST FROM SHOP TO SHOP

Machine operators and their bosses, too, learn firsthand how Lusol speeds their production, lengthens tool life and makes working conditions more enjoyable. Then they tell the story around town and, soon, we get a phone call, "Show me!" The following stories are typical of many we've picked up from Lusol users all over the country.

### "A new machinist

heard that drill 'screaming for help' and suggested trying Lusol there. Since this 2½" drill costs \$60 and we had to sharpen it several times in drilling a hole 3" deep, we really saved money with Lusol. Now the chips come out cool and we drill 7 or 8 pieces between resharpenings."

### "As a subcontractor

we are welding stainless steel strip into jet engine exhaust pipes. That weld line machined badly and caused smoking. Our principal manufacturer recommended Lusol, which we put in a year ago last November. We're getting a beautiful finish, increased speeds and feeds, longer tool life and no smoke."

### "Here in our own plant

the foreman of our lathe department saw us having trouble grinding silver off steel bearing-retainer-rings. The wheels would load up instantly and gouge the steel. Wheel manufacturers tried many different abrasives, but with no luck. We put a Lusol solution into those grinders and now our ordinary wheels do the job. 20 micro finish!"

### "A grinding wheel salesman

told me that wheels (a competitor's, too) weren't our trouble. We were rough-grinding only 3 to 5 pieces before the wheels needed redressing. He suggested a change to Lusol, and now we grind 20 pieces with one wheel dressing. Of course, we're buying his wheels now."

Send for a free copy of the booklet

"Lusol Gets to the Point"

**F. E. ANDERSON OIL COMPANY, INC.**

213-1 Portland, Connecticut

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## Good Reading

A GUIDE TO SIGNIFICANT  
BOOKS AND PAMPHLETS  
OF INTEREST TO TOOL  
ENGINEERS

**FORGING AND FORMING METALS**, by S. E. Rusinoff. Published by the American Technical Society, Drexel Ave. at 58th St., Chicago 37. 184 pp; price, \$3.95.

Technological progress in the forging industry makes it imperative that management as well as operators keep abreast of the newer developments. This book is intended to convey some of the later improvements and techniques as well as others which have been standard for some time.

Impact forging, press forging, upset forging, extrusion, heat treatment of forgings, safety in the forge shop, designing a forged part, designing dies and tools, metal quality, and selection of a metal for forging are described here. Each subject is covered as a separate unit to provide a flexibility which will permit selection or integration of the book's contents to meet specific needs and individual requirements.

**TECHNIQUES OF PLANT MAINTENANCE, 1952**, published by Clapp and Poliak, Inc., 341 Madison Ave., N. Y. 182 pp; price, \$6.00.

This is the third volume in the series on plant maintenance and contains a complete transcript of the formal papers presented at the Third Plant Maintenance Conference held in Philadelphia concurrent with the Plant Maintenance Show. The conference is sponsored by the American Society of Mechanical Engineers and the Society for the Advancement of Management. It includes also the questions put to the speakers and answered by them on the platform, as well as their answers to questions with which the conference time schedule did not permit them to deal.

**STANDARD DATA FOR TURRET LATHES AND HAND SCREW MACHINES**, published by E. A. Cyrol and Co., 120 South LaSalle St., Chicago 3, 113 pp; price, \$1.00.

Utilizing the examples of standard data developed and collected over a period of 15 years in consulting and industrial experience, the authors have prepared the material in this booklet to serve as a workbook and guide in the construction of standard data. The time values presented are actual elemental time values calculated and used in machine shops.

**NUMERICAL METHODS IN ENGINEERING**, by Mario G. Salvadori and Melvin L. Baron. Published by Westinghouse Inc., 70 Fifth Ave., N.Y. 100, 258 pp; price \$6.65.

This presentation is intended to introduce both the student and practicing engineers and scientists to those elementary techniques which are needed more often in the solution of technical problems. It is assumed that the reader has a knowledge of calculus and a smattering of differential equations.

The five chapters of the book deal with: The solution of algebraic equations of high degree and of simultaneous linear algebraic equations; the elementary theory of finite differences and its application to numerical differentiation, integration, interpolation and extrapolation; the solution of ordinary initial-value problems; the solution of ordinary boundary and characteristic-value problems; the solution of problems involving partial differential equations of the boundary, characteristic and mixed types.

In the presentation of the material, finite difference theory is made the unifying basis of all the numerical techniques. This makes the treatment of the subjects economical and avoids unnecessary repetition. It also allows a simple evaluation of errors throughout the book and, perhaps for the first time, the systematic use of efficient extrapolation procedures.

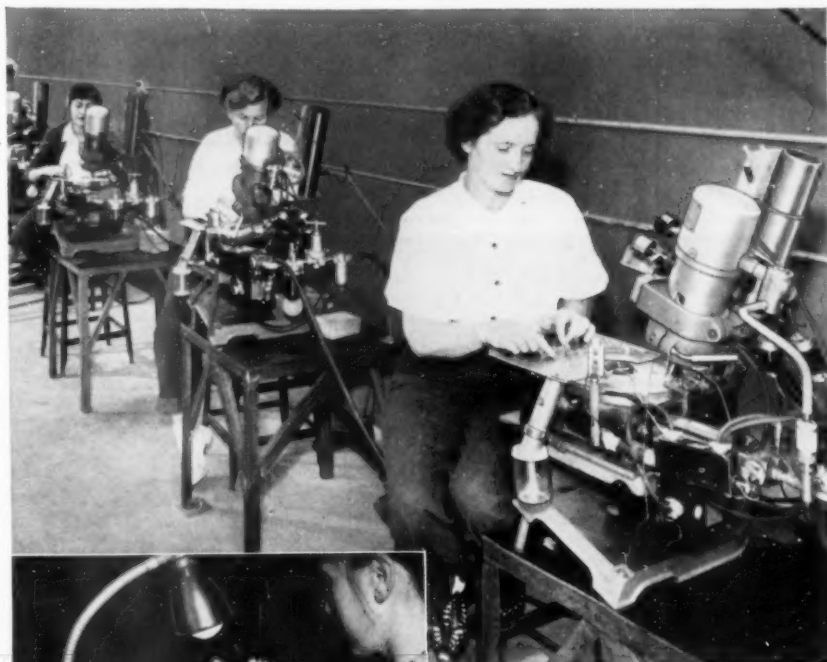
**SELLING TO INDUSTRY**, by Bernard Lester. Published by The Industrial Press, 148 Lafayette St., N.Y. 13. 255 pp; price, \$3.50.

This sales manual is written for the engineer who sells machinery, equipment or technical products to industrial users. Its purpose is to help him reach a higher goal of performance by matching expanding opportunity with improved skill.

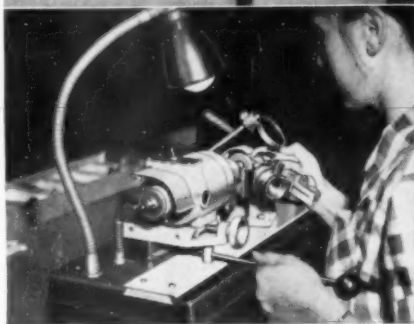
Selling any prospect effectively does not follow a beaten path. Salesmen and prospects vary in temperament, habits and interests. Products also differ, and new problems in their application and use arise continually. But selling is not a haphazard affair. Proper preparation and orderly enthusiastic procedure are necessary. The author attempts in this book to set forth in a brief form those key points that have, from experience, been found to be most effective.

The author has been a sales executive with Westinghouse Electric Corp., lecturer on sales engineering and marketing at the University of Pittsburgh, Stevens Institute and Brooklyn Polytechnic Institute, and a consultant on machinery and equipment marketing and selling.

## 124,800 holes per day! ... using six DUMORE Automatic Drill Heads



Parts are hand loaded in an automatic indexing rotary table with 24 stations. Peak production has reached 23,000 pieces.



A Dumore Precision Drill Grinder is used to sharpen drills after a full day's production. Maximum drill life per grind has reached 23,000 holes.

### Get amazing cost-reducing benefits with DUMORE tools

**T**ALK about amazing production! One west-coast manufacturer uses six *continuous running* Dumore Automatic Drill Heads to drill tiny brass parts — at the rate of 20,800 per head per day. The job calls for a No. 71 drill (dia. .026") and hole depth of .069". In addition to the amazingly high production, the user reports that the Dumore Automatic Drill Heads slash costs of drill breakage, down-time and scrap loss.

Amazing, too, are the results this company achieves using a Dumore Precision Drill Grinder to sharpen their drills for this job. They actually get a maximum of up to 23,000 holes per sharpening. That means a full day of continuous production for every Dumore sharpened drill, *without stopping to regrind*.

Get all the information about these tools — their capacity to increase small hole production — to eliminate operator guesswork — to provide completely automatic control. Ask your nearby industrial distributor for a demonstration, or write:



### THE DUMORE COMPANY

521 Seventeenth Street • Racine, Wisconsin

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# TRADE LITERATURE

Free Booklets and Catalogs  
Currently Offered By Manufacturers

## Tool Steels

Eight-page brochure contains useful reference tables including temperature conversion and hardness conversion tables, shop formulas for obtaining weights of steel bars, a table for determining weights of steel bars of various shapes in pounds per foot, and decimal and millimeter equivalents of fractions of an inch. **A. Milne & Co.**, 745 Washington St., New York 14. **L-2-1**

## Grinding Wheels

Slide-rule type calculator allows speedy selection of proper sfpm and rpm for given grinding wheel diameter. Reverse side carries condensed chart of company's "Electro" resin-bonded grinding wheels with their maximum operating speeds in sfpm for precision and snagging work. **Electro-Refractories & Alloys Corp.**, 344 Delaware Ave., Buffalo 2, N. Y. **L-2-2**

## Lubricant

Bulletin 95 includes technical information on standard industrial grades and compositions of Molykote lubricants. Features detailed description of the principle in lubrication and applications in which the compound might be expected to do a superior lubricating job. **The Alpha Corp.**, Greenwich, Conn. **L-2-3**

## Flame Plating

Illustrated 12-page booklet, "Flame-Plating," describes application of powder metals coatings to metal parts; covers properties of the coatings as well as results of comparative wear tests. Also presents limitations of method and indicates possibilities for advantageous uses and describes preparation and finishing of flame-plated parts. Form 8065, **Linde Air Products Co.**, 30 E. 42nd St., New York 17. **L-2-4**

## Surface Measurement

Twenty-four page illustrated catalog of Profilometer equipment for shop measurement of surface roughness, describes each item in detail, shows it in use and gives complete specifications. Lists typical combinations of equipment most commonly selected for various job requirements. **Micrometrical Mfg. Co.**, 345 S. Main St., Ann Arbor, Mich. **L-2-5**

## Files, Rotary

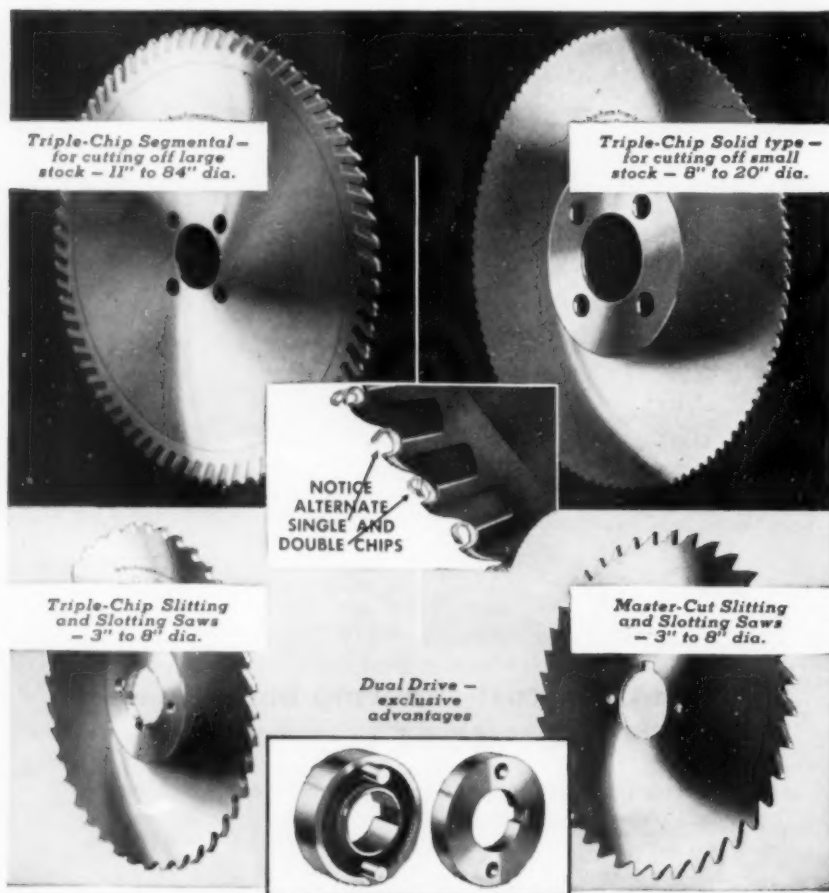
Catalog of complete line of high-speed steel rotary files ground cutters, countersinks, rasps, carbide cutters, end mills and grinding burs gives specifications and detailed descriptions; includes a grade-of-cut chart showing recommended operating speeds for both files and ground cutters. **M. A. Ford Mfg. Co., Inc.**, Davenport, Iowa. **L-2-6**

## Presses, Hydraulic

Illustrated 24-page catalog describes line of hydraulic presses, including both standard and a wide range of special models. Detailed specifications are given for all standard models, and drawings point out special features and advantages. **Verson Allsteel Press Co.**, 9336 S. Kenwood Ave., Chicago 19. **L-2-7**

## Power Supply

Four-page folder 159-20 describes facilities for processing and tooling of gasoline and diesel engines, transmissions, hydraulic torque converters and accessories and power units. **Visi-Trol Engineering Co.**, 9345 Hubbell, Detroit 28. **L-2-8**



## TO CUT OFF STOCK, SLIT OR SLOT, THE NOTCH & MERRYWEATHER TRIPLE-CHIP SAW BLADE OFFERS MANY EXCLUSIVE ADVANTAGES

Fast, burrless cut-off and slitting or slotting with Dual Drive which makes stresses and breakage negligible. Let M & M Triple-Chip saw blades give you the higher production-with-accuracy which Industry must attain and maintain today. Also Master-Cut conventional type with M & M's exclusive Dual Drive. Ask your dealer.

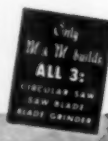
## ALSO TRIPLE-CHIP ANTI-WELD SOLUBLE OIL

For the most favorable results, time- and profit-wise, use Notch & Merryweather's superb coolant. Anti-weld, averting pick-up. Sharper tools and longer-lived. Oily, but not "greasy". Smokeless, odorless. A real aid to money-making production.



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715 PENTON BUILDING • CLEVELAND 13, OHIO  
...IT'S THE COST PER CUT THAT COUNTS...

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### Routing, Milling Cutters

Brochure deals with routing and milling cutters for nonferrous metalworking industries; widely illustrated with photos as well as diagrams, which with practical working instructions and specifications, complete the information presented. **Onsrud Cutter Mfg. Co.**, Engineering Dept. 800-820 E. Broadway, Libertyville, Ill. **L-2-9**

### Time-Cycle Control

Bulletin C305 offers information on the application of time-cycle controllers for timing industrial process operation; illustrates various models available and describes in detail the principle of operation. **The Bristol Co.**, Sales Promotion Dept., Waterbury 20, Conn. **L-2-10**

### Steel Guide

Four-page bulletin designed for easy comparison of different types of hot rolled and cold finished carbon and alloy steel bars, lists characteristics, mechanical properties and uses of various types. **Joseph T. Ryerson & Son, Inc.**, Box 8000-A, Chicago 80. **L-2-11**

### Die Forgings

A "Problem Parts Attack Chart" offers comprehensive yet concise information on solutions of design problems through use of closed die forgings; lists major design factors in order of importance as indicated by survey of industrial designers. **Drop Forging Association**, 605 Hanna Bldg., Cleveland 15. **L-2-12**

### Universal Joints

Catalog 27 illustrates and describes line of universal joints for aircraft and industrial applications; features several application data sheets providing a simple means of indicating specific joint requirements which allows a quick analysis of specialized applications. Well illustrated with graphs, charts, photos and drawings. **The Apex Machine & Tool Co.**, 1049 S. Patterson Blvd., Dayton 2, Ohio. **L-2-13**

### Testing Machines

Catalog 46 gives detailed information on instrumentation, tools and accessories for Universal Testing Machines. Widely illustrated. **Tinius Olsen Testing Machine Co.**, 1138 Easton Rd., Willow Grove, Pa. **L-2-14**

### Shapers

Catalog covers both standard and heavy duty lines of shapers, giving complete descriptions and illustrations of design features, specifications and discussions of uses and advantages of the attachments and accessories. **The Smith & Mills Shaper Co.**, 400 W. Madison St., Chicago 6. **L-2-15**

### Grinding

Brochure announces B & S universal grinding machines. Points out special features and advantages including the flexibility and productivity of the designs. Outlines complete specifications. **Brown & Sharpe Mfg. Co.**, Providence 1, R. I. **L-2-16**

### Electronic Tubes

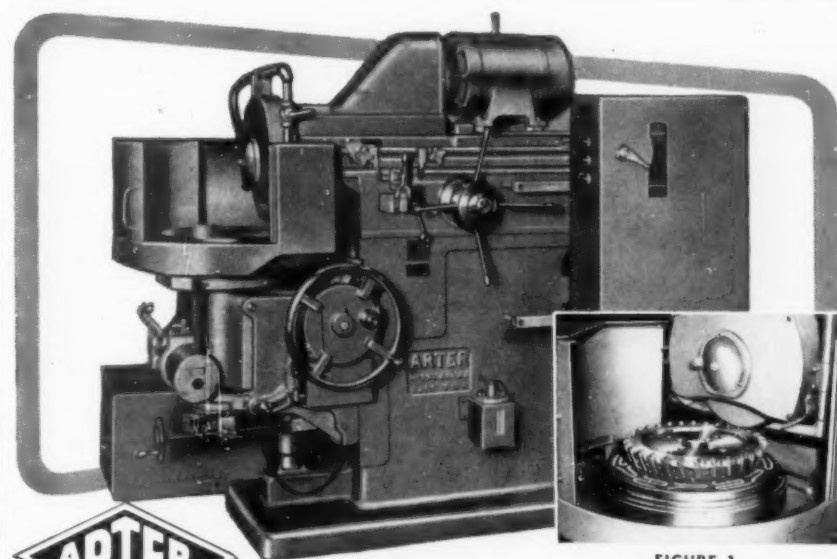
Illustrated treatise on hot cathode gas-filled rectifier and thyatron tubes deals with their history, development and application. "Gas Tubes in Industry" gives a well-rounded introduction to the useful purposes of the tube. **Electrons, Inc.**, 127 Sussex Ave., Newark 4, N. J. **L-2-17**

### Air Power

New edition of Mead Air Power catalog illustrates and describes entire line of single and double-acting air cylinders, and air-operated presses, vises, chucks, valves, hammers, work feeders; emphasizes speed and economy in production. **Mead Specialties Co.**, Dept. P-74, 4114 N. Knox Ave., Chicago 41. **L-2-18**

### Rivet Tools

Fourth edition of Rivet Tool Catalog includes revised dimensions, information on new tools and pertinent up-to-date data. **The Hi-Shear Rivet Tool Co.**, 8924 Bellanca Ave., Los Angeles 45. **L-2-19**



## MODEL D HYDRAULIC ROTARY SURFACE *Grinder*

...for work requiring the utmost precision for flatness, size and finish.

**FIGURE 1**—Inserted carbide tooth milling cutters ground on standard machine.

**FIGURE 2**—Machine built especially for grinding 45° angles on cutters.

**FIGURE 3**—Special Model D grinds by plunge cutting; work fed automatically up to non-oscillating grinding wheel.



FIGURE 1

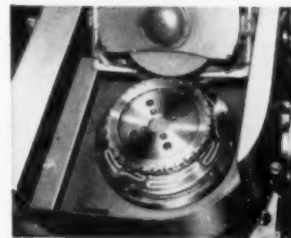


FIGURE 2



FIGURE 3

Write today for complete details and specifications.

**Arter GRINDING MACHINE CO.**  
WORCESTER 5, MASSACHUSETTS  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-129

# North East West South IN INDUSTRY

**Flexitallic Gasket Co.** has announced the appointment of **A. T. Erickson** as executive vice-president. Mr. Erickson joins Flexitallic after 14 years experience with Day & Zimmermann, Inc. engineers.

At a recent meeting of the board of directors of **Morey Machinery Co., Inc.**, several changes in management were made. **S. M. Morey** was made chairman of the board; **Leonard Morey** was named president; **Robert Morey**, vice-president and secretary; **D. T. Himoff**, vice-president, and **Samuel Morey** treasurer.

**George B. Howell** has been named manager of manufacturing for **General Electric Co.'s** Welding Department. Mr. Howell, who formerly was superintendent of manufacturing for the department, succeeds **Thomas Sproule** who has joined the G-E Manufacturing Services Div.

**R. G. Schrock** has been advanced to the position of executive vice-president of **The Euclid Electric and Mfg. Co.** After joining Euclid 30 years ago running a lathe, Mr. Schrock rose steadily until in 1936 he was elected a vice-president.

**Wylie Brown** has been elected a director and chairman of the board of **Hydropress, Inc.** Mr. Brown retired last year as chairman of the board of **Phelps Dodge Copper Products Corp.**, a company he had headed for many years.

**Arthur S. Armstrong** has been elected president of **The Cleveland Twist Drill Co.** He succeeds **Jacob D. Cox** who has become chairman of the board. Mr. Armstrong, who began his service with the company 20 years ago, first in the factory, later as service representative and in various positions in the administrative department, was made executive vice-president in 1949. Mr. Cox has been president of **Cleveland Twist Drill** for 33 years. In his new position he will continue to take an active part in the firm's over-all affairs.



Arthur Armstrong



Edgar Seybold

A number of officers were elected during the recent meeting of the board of directors of **The Hendey Machine Co., Inc.** **Edgar G. Seybold**, who has been associated with the firm for fifteen years as vice-president and director, was elected executive vice-president and director. **Bernard Sassen** was elected vice-president in charge of engineering. He comes to Hendey from **Monarch Machine Tool Co.**, where he was in charge of new product design and the mechanical and electrical laboratory. **Helge G. Hoglund**, who for the past five years has been with **The Heald Machine Co.** as general sales manager, was elected vice-president in charge of sales.

According to recent announcement, **Harry W. Poole** has been appointed director of quality control by **Superior Tube Co.** Mr. Poole formerly was associated with **Brown Instrument Div.** of **Minneapolis-Honeywell Regulator Co.** in research and development.

Also announced by **Superior Tube** was the appointment of **Richard L. Hoff** as development metallurgist. In his new position, Mr. Hoff is responsible for several of the company's important research and development projects.

## STANDARD CARBIDE MILLING CUTTERS

From The World's Most Complete Stock of Standard Carbide Tools




Ask for catalog listing all Super Standard Carbide Tools.





QUALITY CARBIDE TOOLS

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Louis Allis, Jr., formerly vice-president in charge of sales for **The Louis Allis Co.**, has been promoted to a vice-president of the company by its board of directors. Mr. Allis, who has been with the firm 14 years, and is also a director, now joins his brother in the overall active management of its operations. At the same time, **C. G. Skidmore**, formerly sales manager, was elected an officer of the company as vice-president in charge of sales. He also will perform the function of general sales manager.



Louis Allis, Jr.



Henry Warren

**Henry E. Warren** was elected president of the **Mac-it Parts Co.** to succeed the late John S. Cochran. Mr. Warren, who was one of the three founders of the company, has been a director from the time Mac-it was formed in addition to being general manager since 1916 and secretary since 1933.

**Dorian Shainin**, formerly chief inspector of the Hamilton Standard Div., United Aircraft Corp., and **Franklin E. Satterthwaite**, previously quality control engineer and statistical consultant of General Electric Co., have joined **Rath & Strong, Inc.**, industrial consultants. Mr. Shainin is the author of "Quality Control of Job Lots" which was published in **THE TOOL ENGINEER** last year.

Two assignments to key engineering posts have been announced at **AiResearch Manufacturing Co.**, a division of The Garrett Corp. **Helmut Schelp** was named to investigate and screen new products for manufacture; and **W. T. von der Nuell** was appointed senior project engineer. Mr. Schelp recently completed establishment of a special projects engineering group. Mr. von der Nuell was formerly senior project engineer—turbo machinery.

As a result of the growth of the **Alloy Casting Institute**, its board of directors has created the office of executive vice president, and elected **Ernest A. Schoefer**, formerly executive secretary of ACI, to serve in that capacity. Mr. Schoefer has been with Alloy Casting Institute since 1940 when it was formed, and before that served with Alloy Casting Research Institute, its predecessor. He previously was a research engineer in the steel industry.

Four key positions in **Kearney & Trecker's** Special Machinery Div. have been filled according to recent announcement by **Henry H. Lentzner**, division manager. These men will direct the activities of the firm's \$5,200,000 plant scheduled for completion next summer and which will house the new division. **Morris L. Hutchens**, who has been with the company since 1939, was named chief engineer; **Walter J. Hubbes**, who began at Kearney & Trecker in 1931 was made superintendent of the division's manufacturing operation; **Harold W. Kippers**, whose service with the company since 1939

was interrupted by his loan to the War Production Board and Naval duty, will direct sales activities; and **John P. Bunce** who joined the firm 11 years ago, becomes staff assistant to Mr. Lentzner. All of the men were chosen because of their diversified experience.

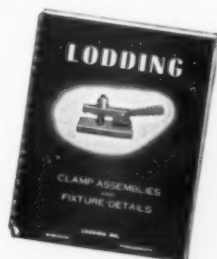
**Michael F. Ryan** has been made production manager for **Yale & Towne Mfg. Co.'s** Philadelphia plant. In addition to his new duties, Mr. Ryan, who previously had been chief process engineer and manager of subcontracting, will continue to be responsible for outside subcontracting work.



## JIG and FIXTURE COMPONENT PARTS

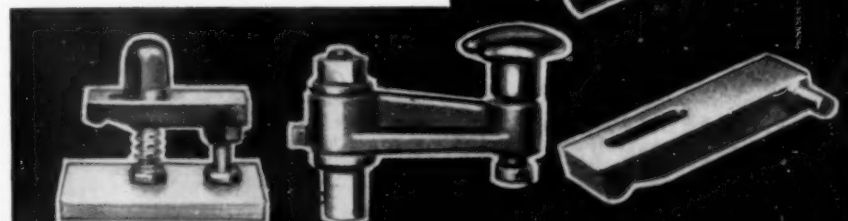
Eliminate the designing and making of clamps and other fixture parts. **LODDING** makes them for you.

**LARGE FACTORY AND DISTRIBUTOR STOCKS ASSURE QUICK DELIVERIES.**



Write for  
CATALOG

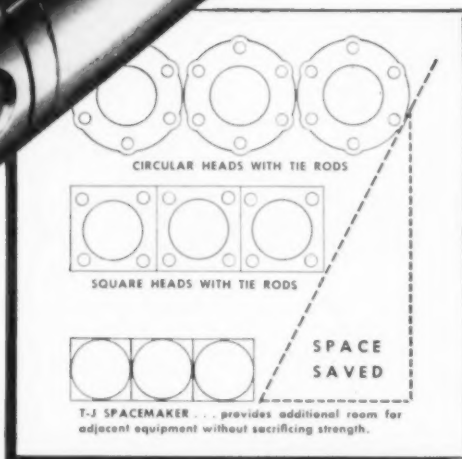
showing 365 items  
that can save you  
time and money.



# LODDING, Inc.

WORCESTER, MASS.

# NEW **(T-J)** Spacemaker AIR CYLINDERS



- SAVES UP TO 40% SPACE WITH NEW STREAMLINED DESIGN.
- SUPER STRENGTH . . . EXTRA HIGH SAFETY FACTOR.
- SOLID STEEL HEADS.
- HEAVY WALL, PRECISION HONED, HARD CHROME PLATED SEAMLESS STEEL BODY.
- LEAKPROOF CYLINDER HEAD TO BODY CONSTRUCTION.
- RELATIVE PORT POSITIONS MAY BE ROTATED WITHOUT DISASSEMBLY OF CYLINDER AND LOCKED IN DESIRED POSITION.
- HEAVY DUTY, HI-TENSILE, HARD CHROME PLATED PISTON ROD.

Streamlined construction of the new T-J Cylinders *eliminates tie rods . . . reduces head size . . . and saves up to 40% in mounting space!* In addition, a new high in strength is achieved with solid steel heads and heavy wall seamless steel body . . . leakproof construction . . . extra high safety factor.

Cylinder walls are precision honed and hard chrome plated for long-life efficiency. Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . both cushioned and non-cushioned . . . for wide range of pushing, pulling, lifting, clamping or control jobs. T-J dependability. *Fast delivery* to meet rush requirements. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.

*Many More Advanced Features!*

**37 YEARS  
EXPERIENCE**

**(T-J)  
TOMKINS-JOHNSON**  
RIVETORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-132

## Abstracts of Foreign Literature

By M. Kronenberg

### Testing Surface Wear

Various methods are discussed by H. Meincke in *Metalloberflaeche* No. 10, 1952, for testing the resistance to wear of reciprocating surfaces. He suggests establishing standards for measuring wear, basing the measurements on pressure existing between the surfaces, on their relative sliding velocity, and on time and relating these quantities to the volume of worn material. The wear testing lathe by Schultz is described and also the Savin wear testing device using carbide discs; in addition, a Siemens wear tester is discussed as well as a newly developed machine by Geraetebau. In this new machine a carbide tip of 0.155 sq in. (100 sq mm) surface is moved back and forth over the surface to be investigated. The pressure can be adjusted to about 60 psi, while the test piece is weighed before and after the wearing test. The author suggests referring all wear data to a standard sliding velocity of 285 fpm and to loads between about 1 and 10 lb. The total length of travel could be standardized at 6500 to 34,000 feet.

### International Standardization of Rockwell Hardness

Kurt Meyer in an article in *Werkstattstechnik und Maschinenbau*, November, 1952, suggests holding a convention for international standardization of hardness data and methods and in particular for Rockwell C hardness, which is now mostly used in machine shops and laboratories alike.

According to the author's findings, hardness readings are greatly affected by the care of the operator. A slight vertical displacement of the workpiece after applying the 10-kg preload can falsify the reading. Among other items, he has also investigated the effect of deflections of the C-frame of Rockwell testers on the readings and found that as much as half a Rockwell unit may be incorrectly indicated by deflection alone. He lists some other 60 causes which may contribute to inaccuracy in the hardness readings such as backlash in the mechanical lever system, inaccuracy in the indicator, the effect of positioning of the workpiece, the location of the impression, the shape of the workpiece, the speed of load application, room temperature changes, humidity, shop vibrations, training of the operator, and many more. He also suggests

standardizing hardness reference plates and data and changing the present rectangular shape of the reference plates to a triangular shape in order to avoid confusion with older plates.

#### Carbide Grinder Data

The surface speed of wheels for grinding carbide tools should not be higher than about 5,000 fpm if the machine is hand operated and not higher than 3,000 fpm in the case of mechanically operated grinders, according to an article by H. Oddenhausen in *Werkstattstechnik und Maschinenbau* No. 11, 1952.

Grinding cracks are likely to occur when the speeds are higher. On the other hand, however, the grinding wheel surface speed should not be permitted to drop below 3000 fpm when hand operated and not below 1200 fpm when machine operated because excessive wheel wear would result. These limits can be maintained on a grinder equipped with a roller contacting the grinding wheel opposite the operator's stand, that is, at the rear of the wheel. As the wheels wear and their diameters reduce, the corresponding change in roller position relative to the axis of rotation causes a change in the electrical field of the motor, thereby increasing the speed of the wheel so that the surface speed can be kept constant. In a different design of a cutter grinder, the truing device is used in a similar way for changing the electric field and increasing the rpm to keep the surface speed unchanged. The article contains detailed information on grinding speeds, motors, wheel diameters and other items which affect operation and design of such grinders.

#### Chucking Devices and Cutting Tools

Numerous examples covering recently developed chucking devices and cutting tools are discussed in an article by K. Seidler in *Zeitschrift des Vereines Deutscher Ingenieure* for Nov. 21, 1952, among which the following will be of particular interest.

The author describes a diamond wire lined with diamonds for the purpose of cutting out holes and shapes in carbide plates to be used as dies. The wire has a diameter of 0.040 inch and is about 5 1/4 inches long. About 4 inches of its length carries several layers of diamonds. The wire rotates and also performs a reciprocating motion. The rotary speed can be adjusted between 400 and 15,000 rpm.

A hydromechanical drive plate for engine lathes is illustrated in the article showing dogs with automatic compensation for elongation of the workpiece and for increasing pressure. This

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device is so designed that the center locks automatically when in use.

Other devices described in the article include a burnishing tool for the main and pin bearings of crankshafts, a milling cutter composed of gang cutters which can be assembled without use of an arbor, a magnetic holder for positioning of parts before and during welding, a live center with adjustable needle and roller bearings and spring support for axial loads, a milling device for milling of rectangular holes as well as many drilling fixtures, a face-milling cutter with a novel method for clamping the blades, etc. The article refers to exhibits at the Hanover Machine Tool Show and covers about fifty such items.

## Measuring Surface Finish

Instruments needed for measuring surface finish are critically analyzed by L. Hermann in an article published in the August, 1952 issue of *Werkstatstechnik und Maschinenbau*. He indicates that the main interest lies in measuring roughnesses between 0.000 080 and 0.000 002 inch, while less accurate surfaces are of minor interest both for the shop and the laboratory.

The instruments which are available in Europe and America, in the author's opinion, do not meet the requirements. An additional difficulty is that American and British instruments measure quantities substantially different from those measured with German devices. It is not possible to convert the data obtained on different instruments. Since it is not possible, therefore, to compare the various profilometers, the author has studied various data obtained with them; that is, he has compared the instruments with regard to travel distances of the needle, velocities and accelerations, and included the size of the needle radius. In his tests the author used an electron-microscope, an interference microscope, a Lietz-Forster analyzer, a Brush surface analyzer and the Talysurf instrument. He assumed that the readings taken with the electron-microscope were as correct as presently possible and referred his data to them.

Using two different samples, one where the lines had been made chemically and one where they had been produced mechanically, the author found that mechanically produced surface scratches were considerably more difficult to measure than those made by acids. The interference microscope showed 0 percent error on both samples, while the three other devices showed between 83 and 90 percent error on the mechanically produced surface lines and 7½ percent on the other sample. Actual surface roughness on the mechanical sample was 0.000012

ch while the surface analyzers measured only values between 0.000001 and 0.000003 inch. On the chemical surfaces the readings were much more accurate.

The analyzers, however, are considerably easier to handle than the microscopes. In addition to these tests the author reports also on the Trentini instrument, the Schmaltz tester and on comparative grinding investigations covering various surface conditions. He also included turning tests and found that under certain circumstances the fine turning process would produce surfaces which would be satisfactory and might reduce the relatively high cost of grinding by a preceding fine turning operation. For this purpose it is claimed, however, definite data for surface roughness and for measuring it accurately must be made available to the tool engineer.

## Who's Meeting - and Where

**Feb. 2.** MACHINE DESIGN CONFERENCE, sponsored by Cleveland Engineering Society, will meet to discuss methods in design, engineering, invention and other pertinent problems. Contact society office, 2136 E. 19th St., Cleveland 15, for more details.

**Feb. 10.** AMERICAN SOCIETY OF LUBRICATION ENGINEERS is sponsoring four seminar meetings on industrial lubrication to be held at the Bellevue-Stratford Hotel, Philadelphia, on consecutive Tuesdays, ending March 10. Further information and application forms are available from C. R. Schmitt, E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33.

**Feb. 16-19.** AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS. Annual meeting, Hotel Statler, Los Angeles. Details are available from the institute headquarters, 29 W. 30th St., New York 18.

**Feb. 18-20.** SOCIETY OF THE PLASTICS INDUSTRY INC. Annual reinforced plastics conference, Shoreham Hotel, Washington. For facts write the society office, 67 W. 44th St., New York 36.

**Mar. 2-6.** AMERICAN SOCIETY FOR TESTING MATERIALS. Spring meeting, Hotel Statler, Detroit. Contact society office, 1916 Race St., Philadelphia, for more information.

**Mar. 9-11.** MANUFACTURING STANDARDIZATION SOCIETY OF THE VALVE & FITTINGS INDUSTRY. Annual meeting, Commodore Hotel, New York. Society headquarters, 420 Lexington Ave., New York, can provide details.

February, 1953

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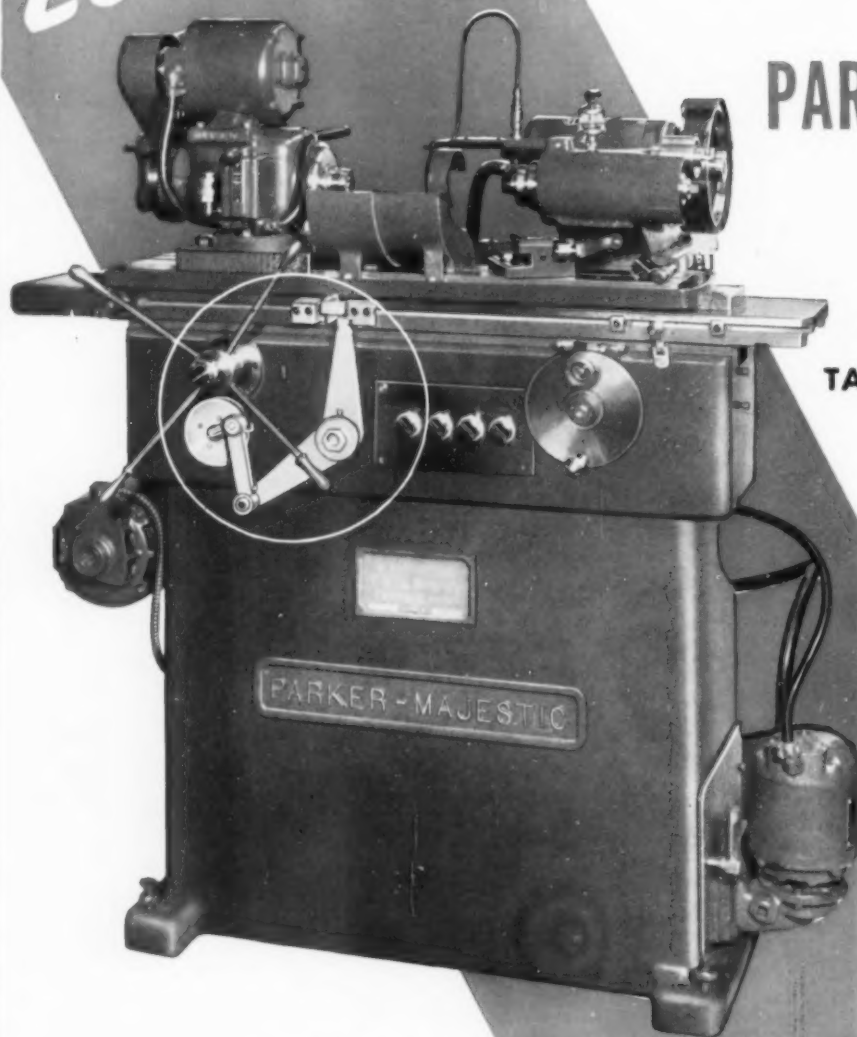
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## Technical Shorts..

**B**ASIC RESEARCH on grinding surfaces, being conducted at Mellon Institute by the L. Leslie Byers Memorial Fellowship is bringing to both engineers and production management valuable data on the subject. The Fellowship is sponsored by Grinding Wheel Institute, and is under the direction of Dr. Harold R. Lerner.

Several important results which have been brought to light by researchers looking for "What happens to a surface when it is ground?" include:

1. Development of better techniques has facilitated study of residual stresses in surfaces. Such stresses may have an important effect on service life of manufactured parts.

Depending upon the type, magnitude and location in the part, and the forces to which the part is subjected in use, the stresses may be beneficial or detrimental.

2. Considerable information has been compiled through study of residual stresses in surfaces generated by abrasive action. As in other mechanical methods of generating surfaces, grinding induces residual stresses.

3. Study of the subject reveals that these stresses may be either tensile or compressive, depending upon direction and depth below the surface. Thickness of the stressed layer depends on composition of the steel, its heat treatment and severity of the grinding.

In experiments conducted so far, the layer varies from about 2.0 to more than 0.040 of an inch. Highest stresses usually were found to lie well within 0.001 inch of the surface in this type of grinding.

4. Lapping with loose abrasive induces compressive stresses in steel surfaces which extend a few ten-thousandths of an inch into the metal.

5. Barrel finishing with abrasive grain induces predominantly compressive stresses in steel surfaces.

6. Preliminary studies of residual stresses in glass and plastic indicated that these materials are similar to steel in their reaction to grinding.

7. Compiled information also concerns residual stresses resulting from heat-treatment of steel.

In addition to this study, future plans of the program will extend the experiments to include methods of alleviating grinding stresses when they are detrimental, and fatigue studies to determine their effect upon service life.

**A** STRAIN GAGE that can become tiny enough to get into tight places has been introduced by Baldwin-Lima-Hamilton Corp. Whatever size is required by the operation dictates the dimension to which the user trims the gage which can be trimmed as small as 0.10 in. wide and 0.14 in. lengthwise. This will enable strain to be measured in very cramped quarters or on very small pieces.

**A** PROCESS for producing "cold rubber" 50 times faster than current methods, and do it at less cost, is the promise of scientists at B. F. Goodrich Chemical Co., a division of The B. F. Goodrich Co., where research on the subject has been going on for the past 12 years. The process is said to make high quality cold rubber in 15 to 20 minutes as compared to the 10 to 12 hours now required. In addition, by the new method, rubber is made in stainless steel pipes rather than in expensive pressure vessels—eliminating considerable cost.

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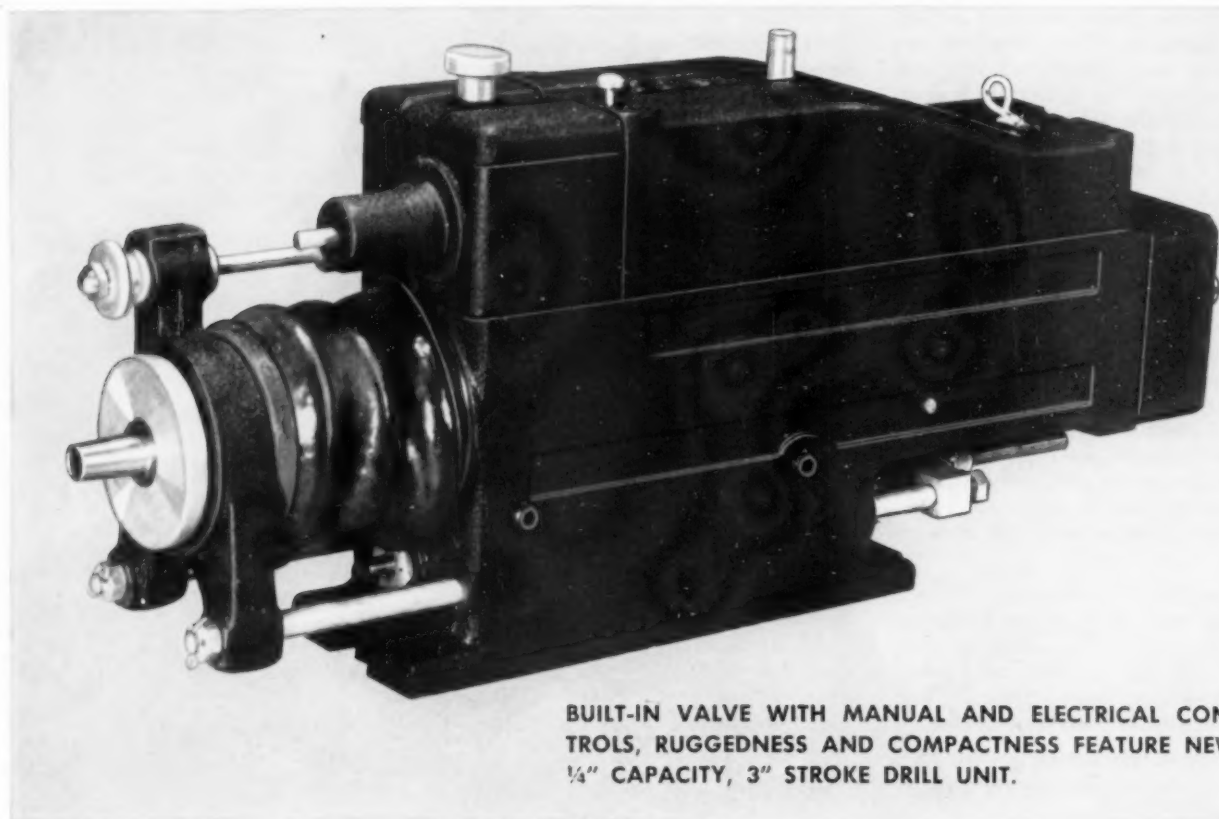
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*This special purpose machine at The Perry-Fay Co., Elyria, Ohio, uses 8 Bellows-Locke Drill Units to drill twelve  $7/32$ " holes in less than 1-1/2 seconds.*

The Bellows-Locke Drill Unit can be mounted horizontally, vertically, or at any angle. Its small size ( $21\text{-}1/16$ " long by  $3\text{-}1/4$ " wide by  $7\text{-}11/16$ " high) lends itself to space saving design. Used with a 1750 RPM motor, spindle speed range is adjustable from 690 to 4630 RPM through the Bellows Speed-Selector Pulley. (Motor and Speed Selector Pulley are optional.)

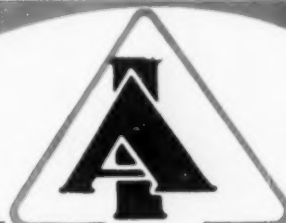
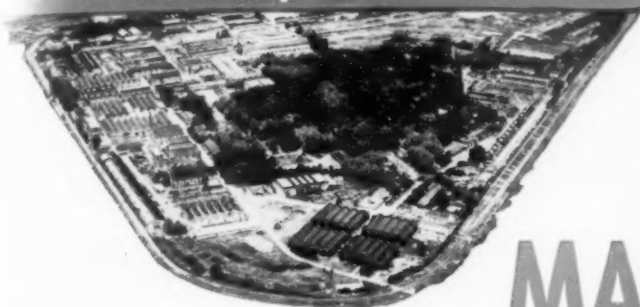
As standard, the unit is equipped with built-in directional air valve with built-in solenoid, as well as manual start and stop controls. It is available with optional electric controls to provide deep hole drilling with automatic drill cleaning, or time controlled dwell. The Bellows-Locke Drill Unit can be factory equipped with any standard tapping head.

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Saddle travel, cross .....	8½"	Wheel speeds .....	3000/6000 r.p.m.
Wheel head travel, vertical .....	10½"		

Attachments available for Heavy Duty Cylindrical, Internal, Radius,  
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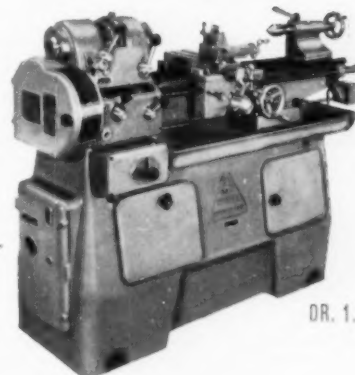
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Distance between centers .....	30"	Automatic cross feeds .....	.0003"—.033"
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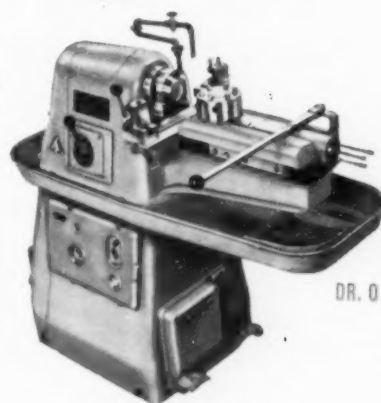
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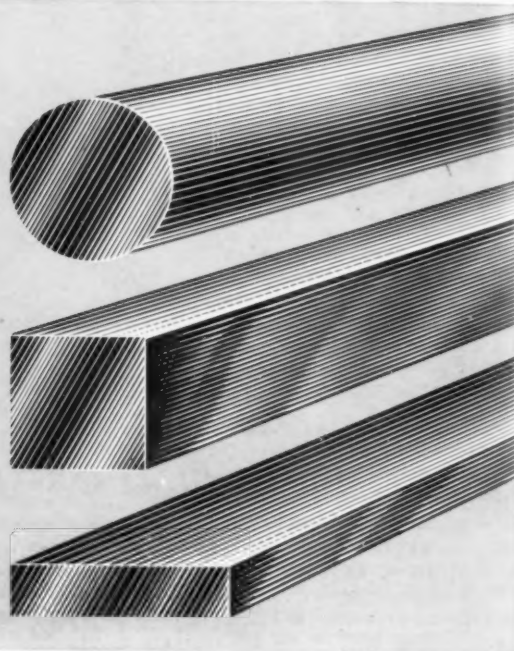


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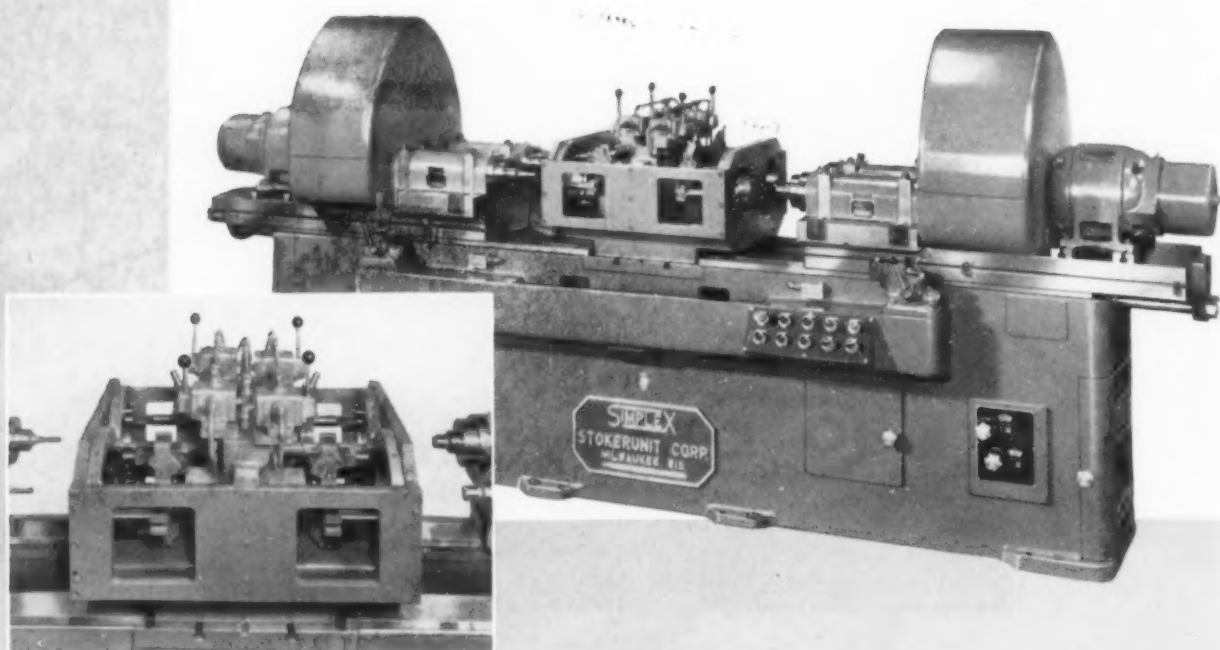
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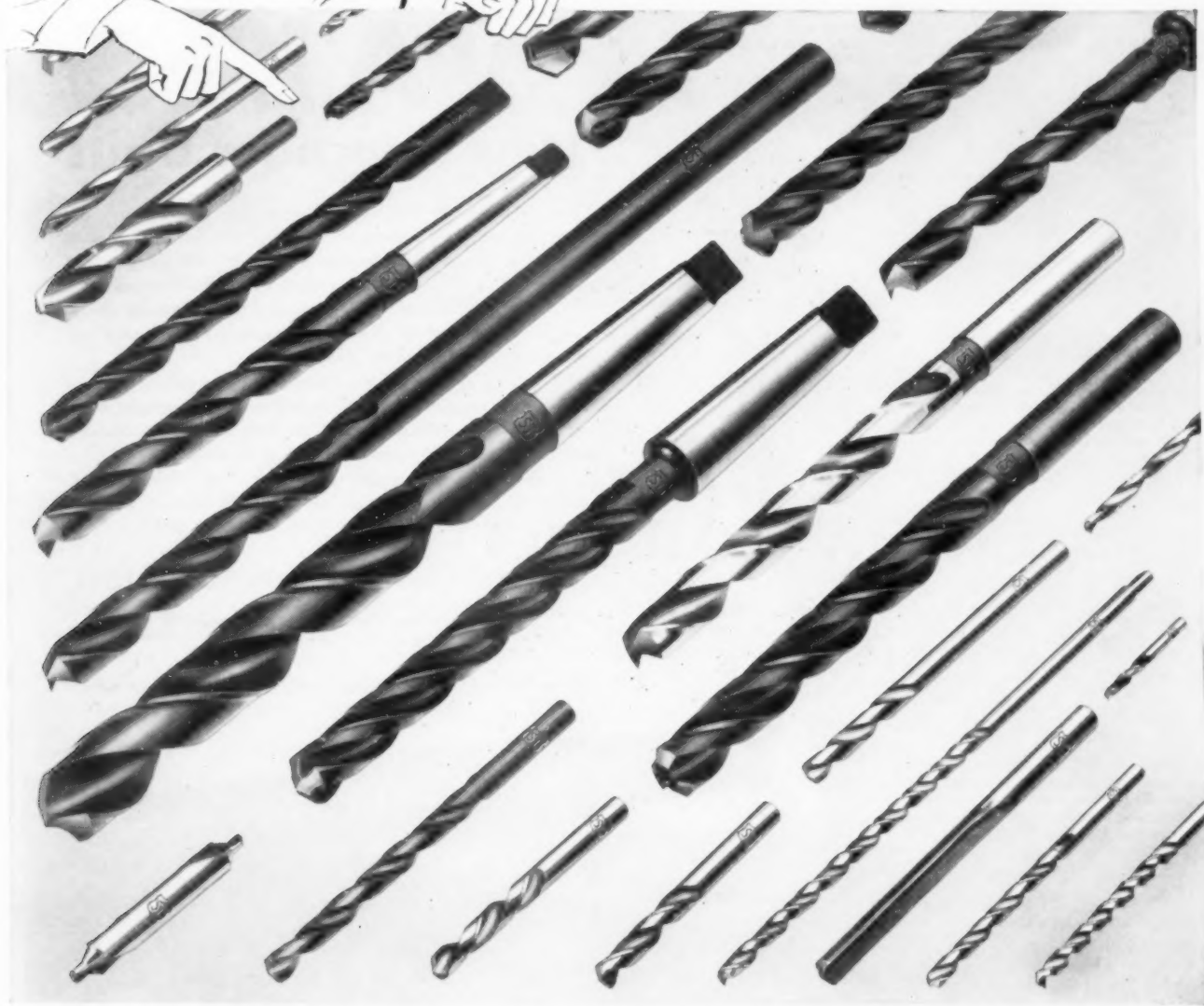
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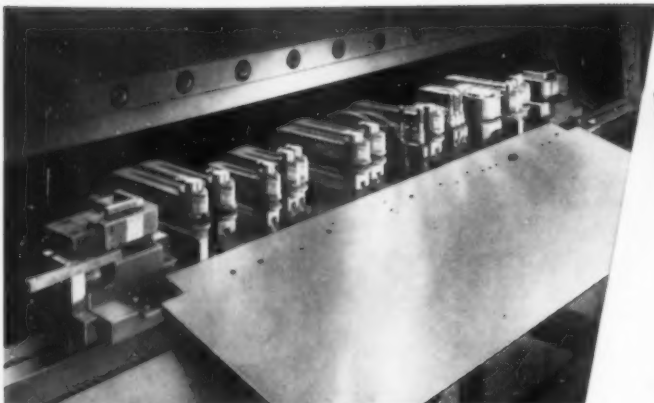
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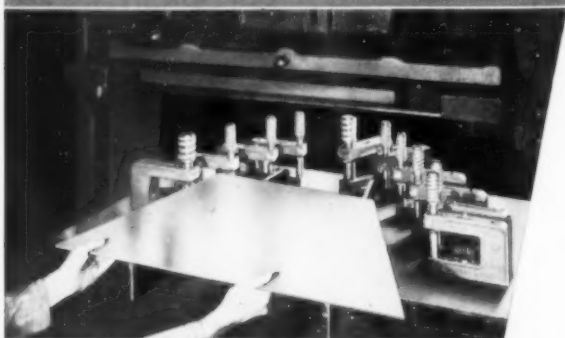
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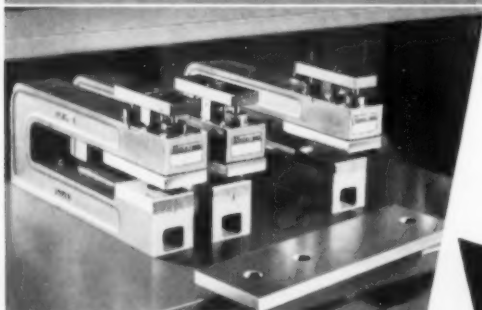
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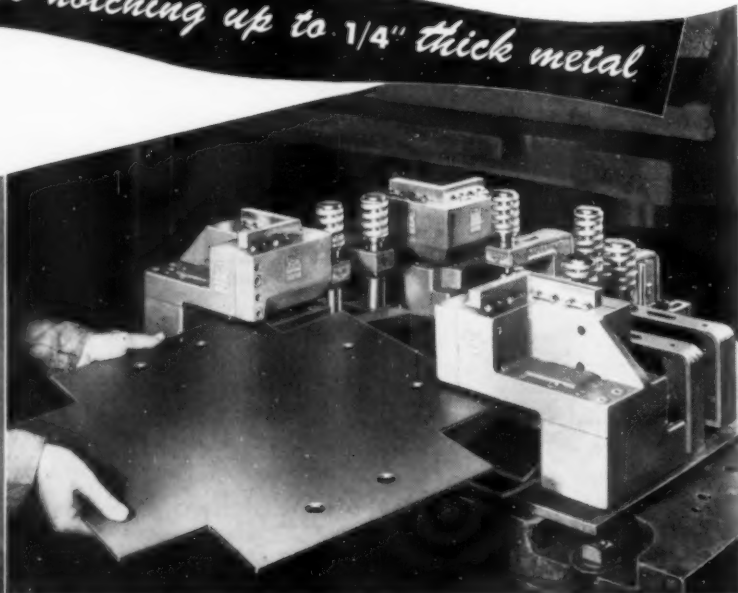


A stamping press setup of Wales Type "CJ" Hole Punching Units for punching mild steel up to 1/4" THICK.



Showing a setup of Wales Type "HS" Hole Punching Units in a press brake for punching mild steel up to 3/4" THICK.

Showing a setup of Wales Type "NJ" Notching Units in a stamping press for notching mild steel up to 1/4" THICK.



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# Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

## Invisible Cracks and How They Were Cured



One of our customers reported trouble with a roll used in the making of fine silverware. Made of A-H5, our 5-pet chromium air-hardening steel, the roll was of 6-in. diameter with a 10-in. working face, highly polished. It worked fine at first. Then a fine network began to show up on the silverware being rolled.

We suggested that the customer bring the roll to our plant, where we have the most modern facilities for diagnosing ailing tools and dies. When the roll was magnetic-particle tested, what appeared to the eye as a beautifully polished surface was revealed to be a fine network of grinding cracks.

"Never had that kind of cracks before," said the customer. "Can we get rid of them on a roll of such high hardness?"

"Yes," we replied. "But it's going to be a tricky job." So we checked with the experts in our division that produces hardened steel rolls. "It's not easy," they told us, "but it can be done. Use a wheel with a very coarse grit with a soft binder. Remove the surface at a maximum rate of .0005 in. per pass. You'll clean up the cracks somewhere between .005 and .010 in."

Then we checked with our specialist on grinding wheels, who gave us the exact code numbers for the grades of wheels that would make it possible to salvage the roll—and also prevent the recurrence of grinding cracks. Our customer went away well satisfied . . . and he's still using A-H5 with fine results.

Bring your tool or die troubles to our technical staff for advice that's based on years of practical experience—not just in making fine tool steel and in helping customers solve their problems, but in using hundreds of tons of our own tool steel each year in our manufacturing divisions. Perhaps we can help you!



This piece of Omega tool steel, tops in resistance to cold shock, will see service as a retainer block for a header die that is subjected to terrific loads in the cold-heading of steel artillery shell cases.



Some rough forgings of Lehigh S tool steel provide an interesting contrast to the finished liner for a tapering die which puts the desired taper on a 105-mm shell case after it has been headed.

## COLD-EXTRUDING CALLS FOR GOOD TOOL STEEL

Great advances are being made in the technique of cold-extruding steel. It's a development that opens up new horizons in metalworking. The severity of this type of work calls for a variety of blue-ribbon tool steels—some must have the ultimate in wear-resistance, others must withstand terrific shock.

Bethlehem tool steels are in plentiful evidence wherever cold-extrusion tools and dies are being made. The accompanying photographs, made at Carando Machine Works, Stockton, Calif., show punches and dies being made from Bethlehem tool steels for use in the cold-extrusion of steel shell cases.

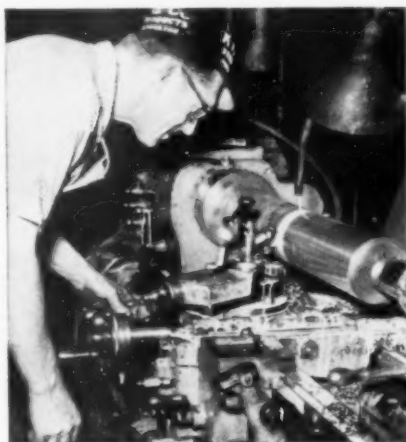
### BETHLEHEM TOOL STEEL ENGINEER SAYS:



**Avoid sharp corners  
in designing tools**

Tools designed with sharp corners, such as in square holes, can often be produced satisfactorily when liquid-quenched tool steel is used. However, such designs are often so hazardous that a large percentage of cracked tools can be expected, no matter how carefully the heat-treatment is performed.

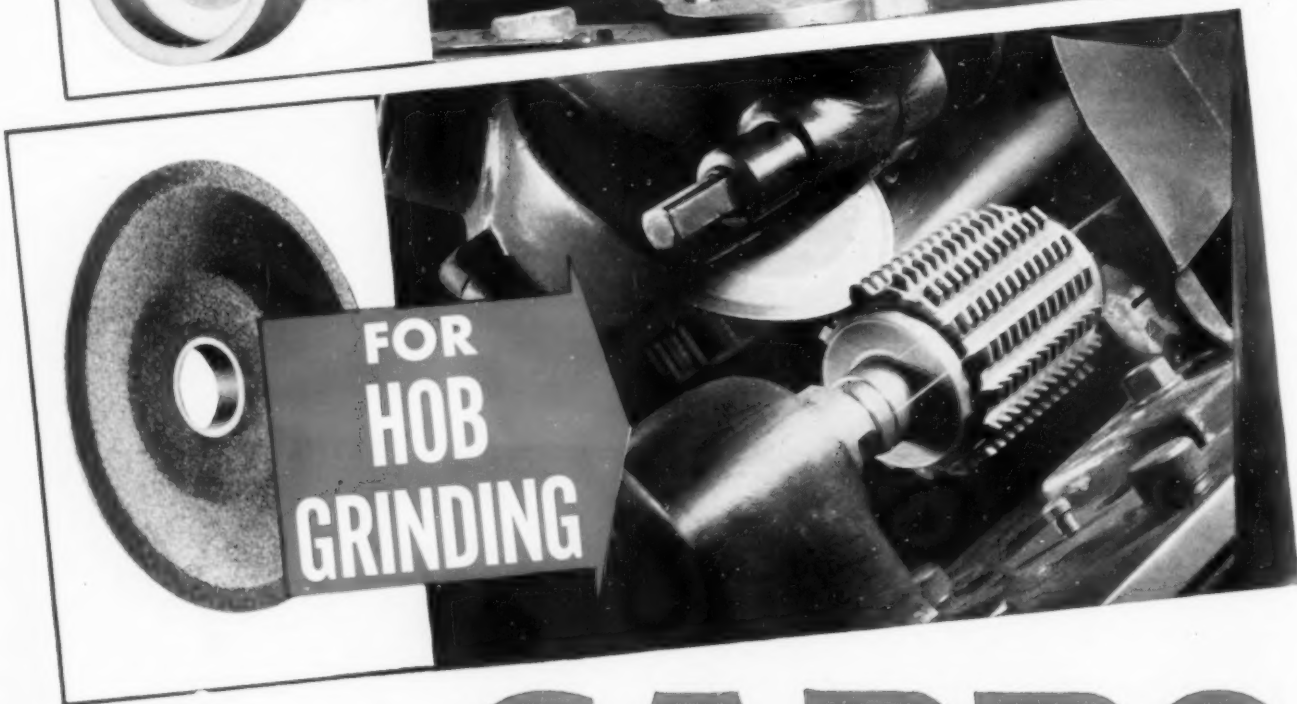
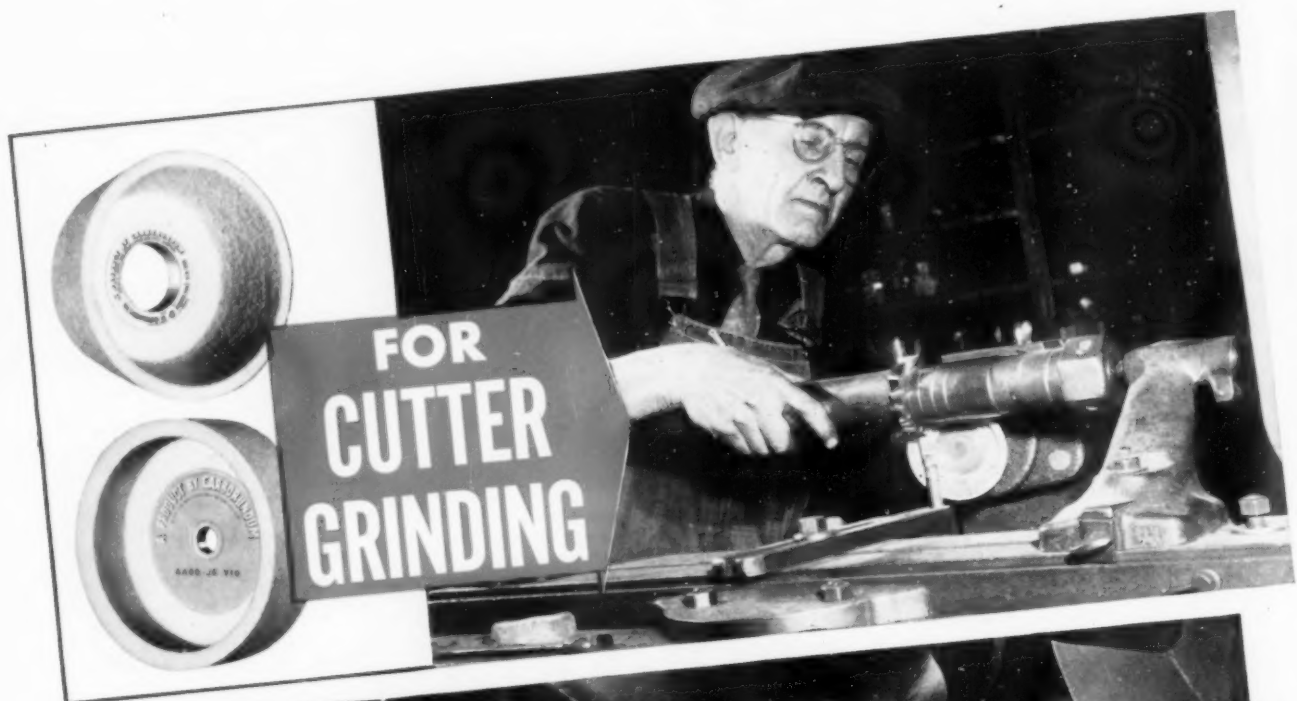
When the sharp corners are not necessary, the solution is of course to provide fillets. But when square holes or other sharp corners are essential in the design of the tool, the use of an air-hardening steel is recommended.



A bar of Lehigh S is being turned in a lathe to form a draw punch for a 3-in. cartridge case. Lehigh S has the highest wear-resistance of Bethlehem's high-carbon, high-chromium grades. It also holds to accurate size in heat-treatment.



# Tool room grinding

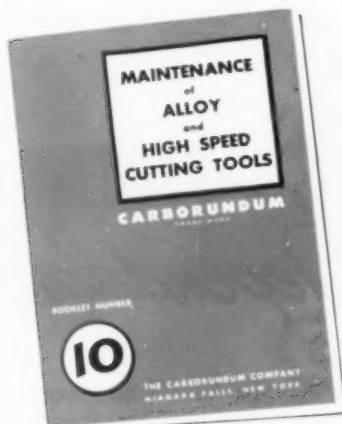


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# wheels...



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ADDRESS DEPT. TE-38

This 72-page catalog lists the stocks of A-L High Speed and Tool Steels which are constantly maintained in each of 18 warehouses, located at convenient points from coast to coast. In compact, easy-to-follow style, the book gives a complete stock picture, nationwide, of the 15 most widely used types of these steels—each in a full range of standard shapes and sizes—and also includes data on stocks of drill rod, tool bits and Carmet carbide metal blanks and tools.

It may be that your requirements call for mill shipments. If so, you can rely on us to schedule material for you without delay. *But*—if you depend entirely or in part upon ordering High Speed and Tool Steels in smaller lots—and want to know where you can get them *quickly*—you'll find A-L's book of "Warehouse Stocks" mighty handy to have in your desk. ● Write for your copy *today!* Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

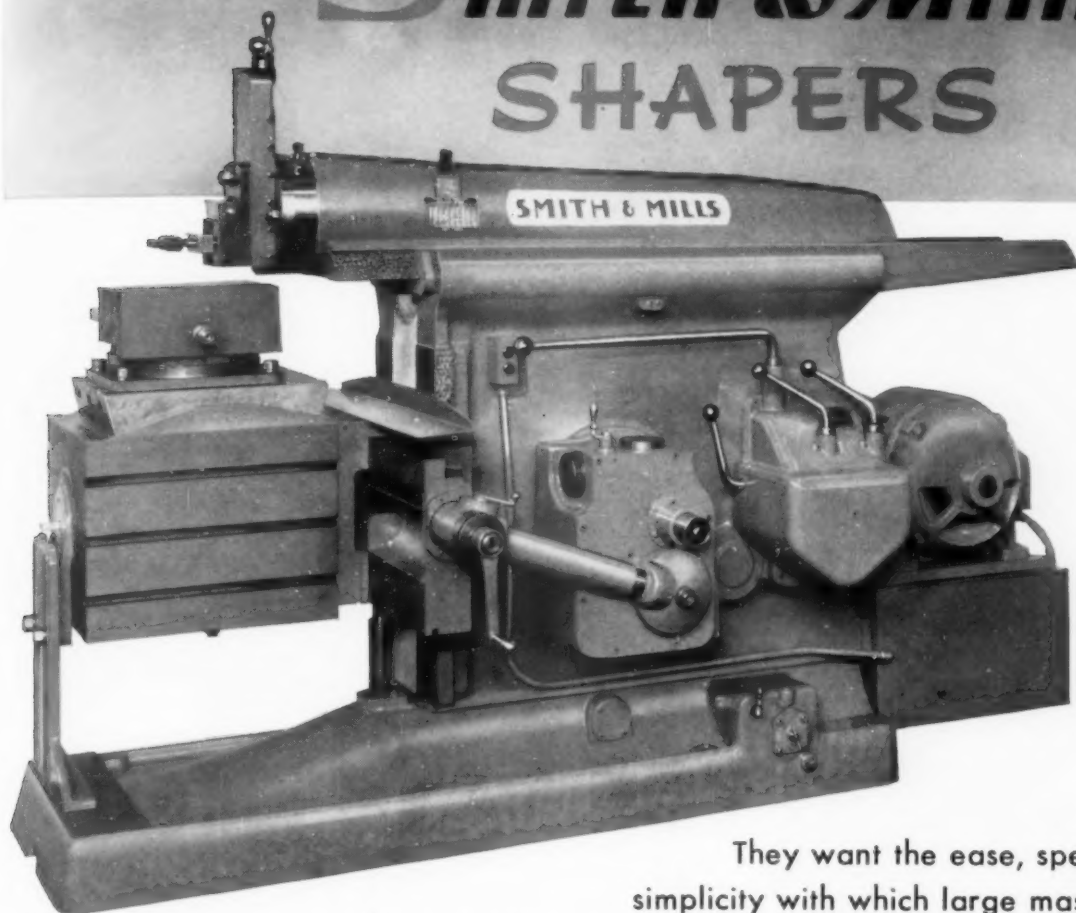
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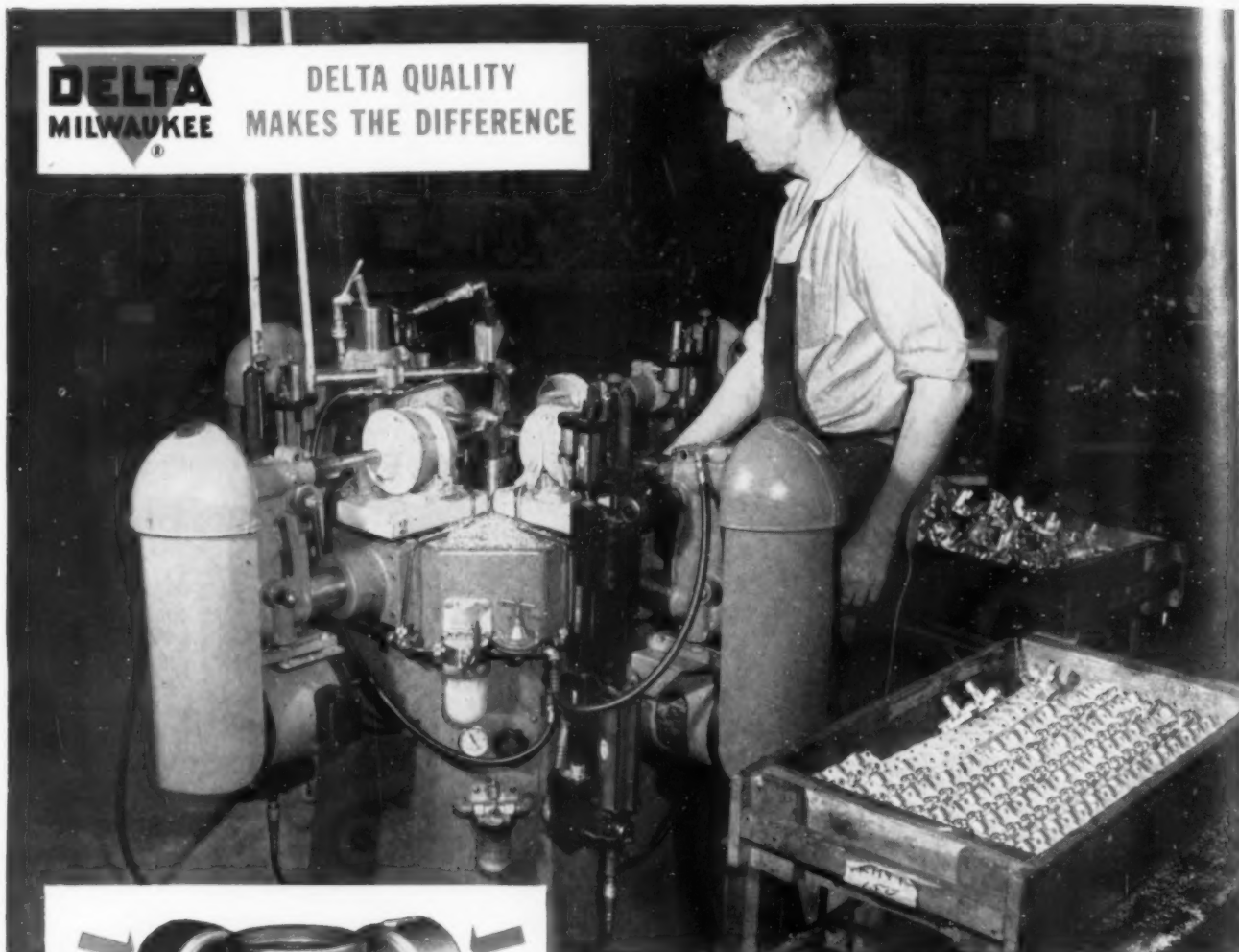
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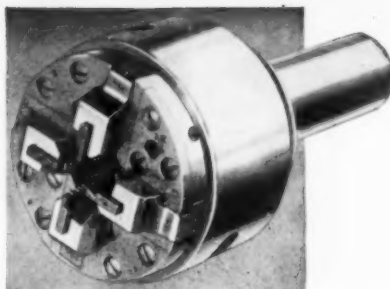
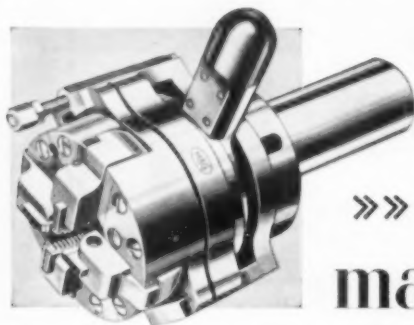
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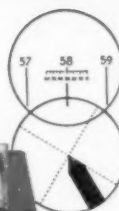
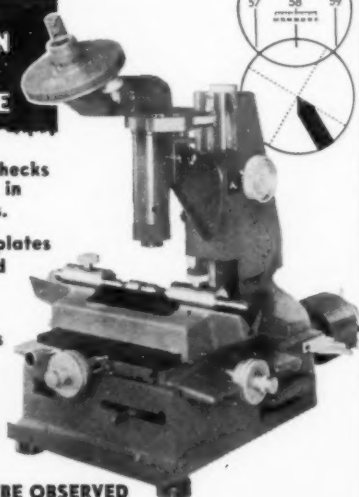
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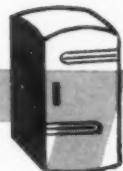
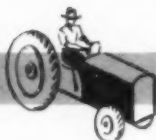
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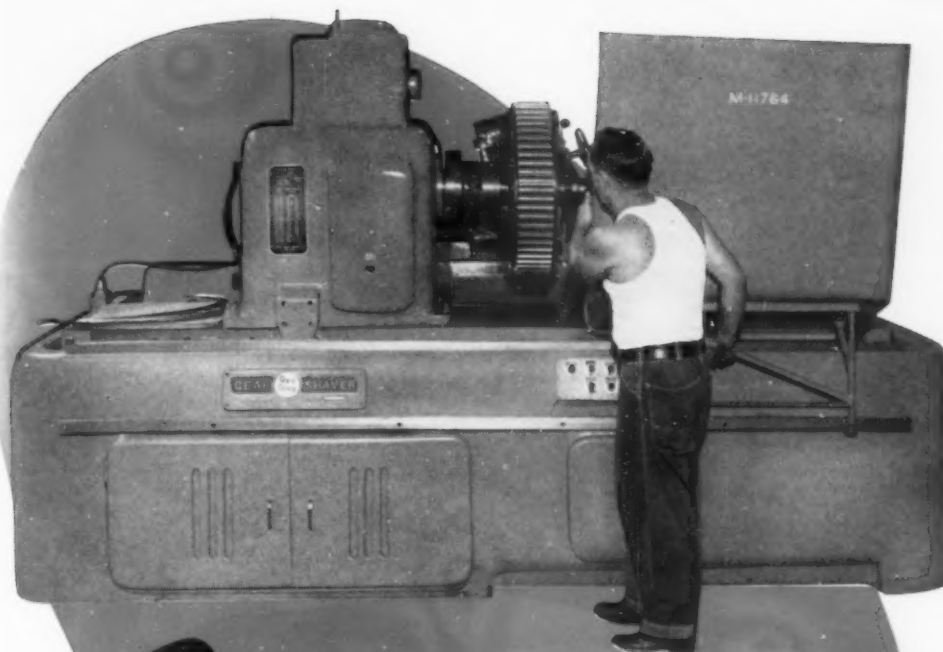
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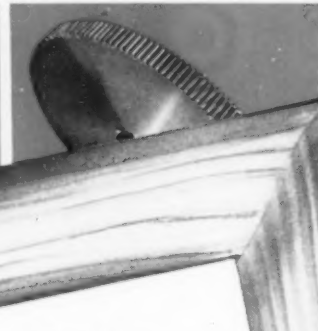
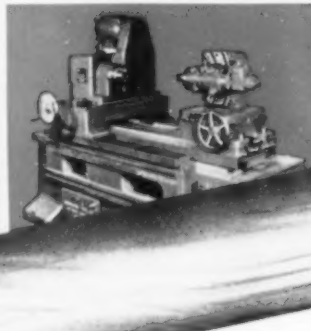
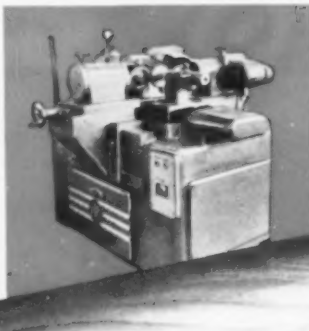
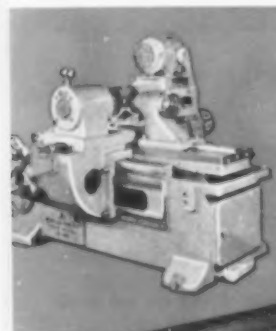
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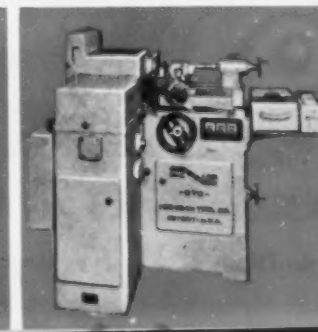
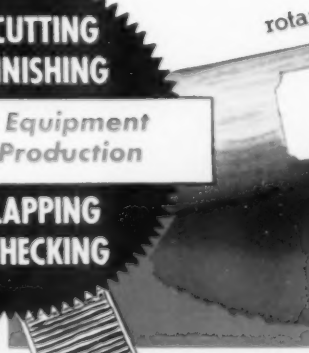
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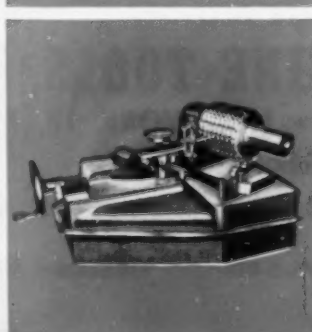
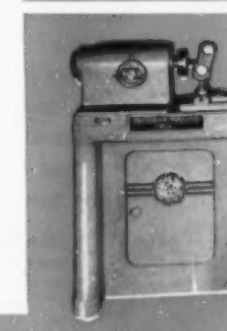
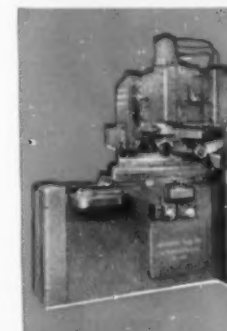
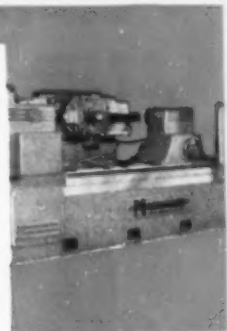
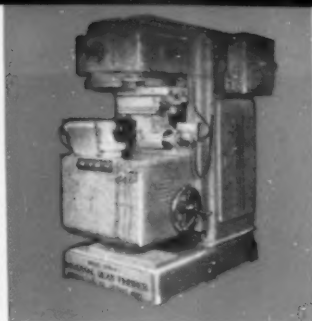
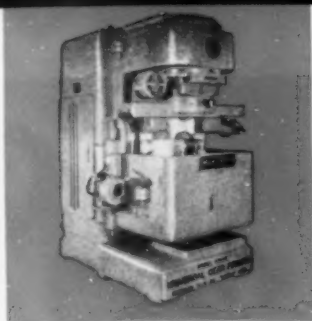
**GEAR PRODUCTION HEADQUARTERS**



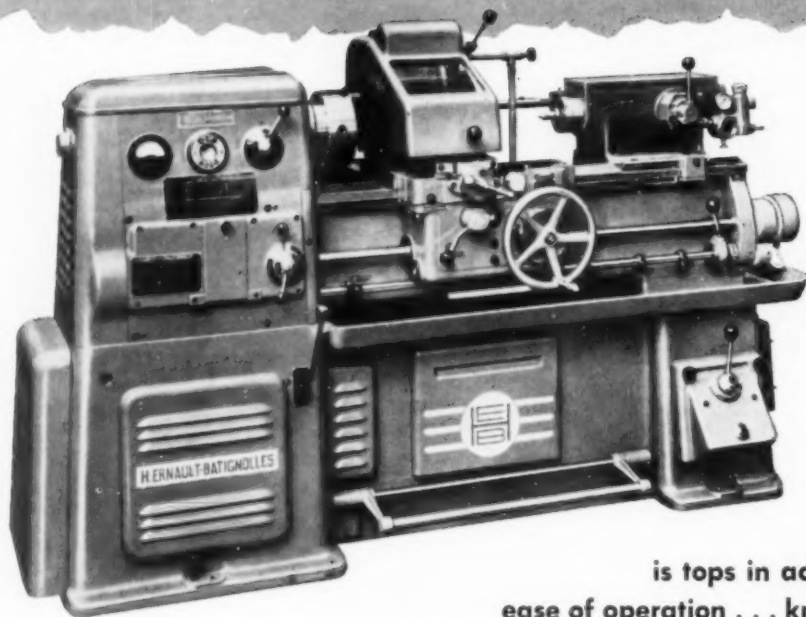
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in over 1,000 plants*



## HIGH SPEED HYDRAULIC COPYING LATHE

Those who have compared copying lathes know the H.E.B. is tops in advanced design, construction and ease of operation . . . know that the H.E.B. means faster, trouble-free production with better finish, no distortion of the work.

The H.E.B. Copying Lathe has higher spindle speeds—up to 3600 RPM in the OP Models to take full advantage of carbide. GT Models with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

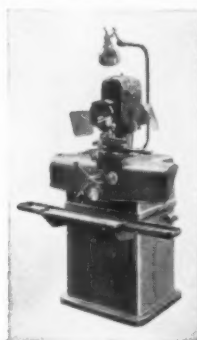
You won't find *chips* any problem at all. A sloping bed together with a built-in coolant pump result in automatic wash-away of the chips into a rear pan, from which they are easily removed *without stopping the machine*. Featured too are the power operated back tool posts which are part of the standard machine.

Remember, the H.E.B.'s patented copying device is an integral part of this ruggedly constructed lathe, resulting in rigidity and accuracy. Setting time is reduced to a handful of minutes, and finished parts are copy-turned up to 300% faster than on multi-tool lathes.

Designed and built in France by H. Ernault Batignolles—machine tool manufacturers for almost a hundred years!

*If you are planning to make an investment in a copying lathe you want the best . . . Study our insert in Sweet's Machine Tool Catalog—Or write or phone us for detailed catalog or a demonstration!*

### TYPE 178 CONSTAN CARBIDE TOOL GRINDER



Specially designed for carbide tools without attachments. Heavily built, the Constan combines smooth operation and ease of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the tool may be clamped in any position. Two diamond wheels are mounted on the wheel head, and each may easily be brought into position.

**H·E·B**  
"THE WAY TO TURN"

IMMEDIATE DELIVERY

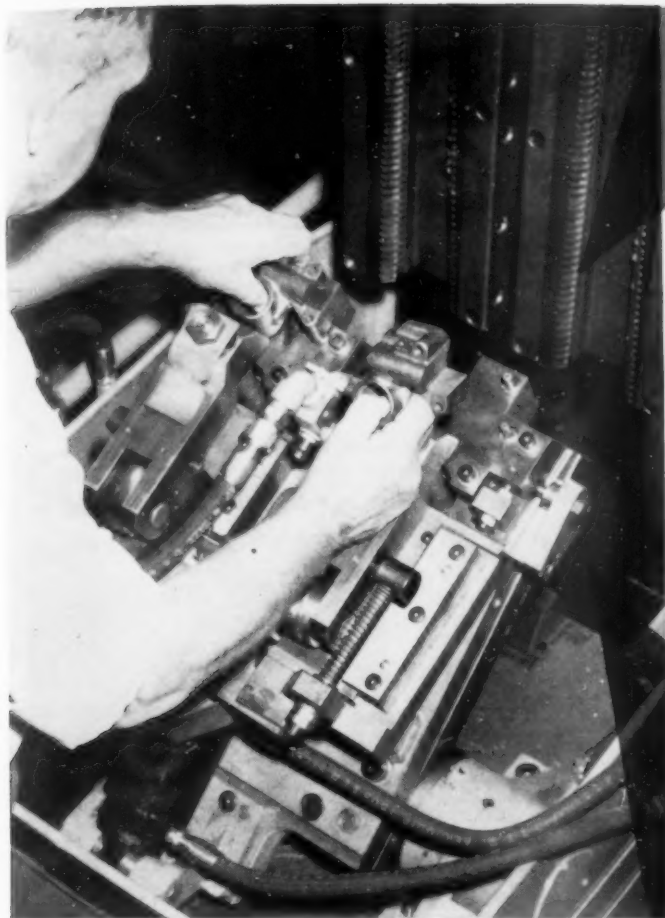
**H. E. B. MACHINE TOOLS, INC.**

475 FIFTH AVENUE • NEW YORK 17, N. Y.

Telephone: LExington 2-0266

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDER





## FIXTURE AUTOMATICALLY TILTS, CLAMPS PARTS for GENERATING TYPE BROACHING

Illustrated are the two parallel surfaces broached in one pass on the American SB-42-10 single ram surface broaching machine equipped with a completely automatic fixture.

*Speeds production of parking brake brackets designed and built the **American** way*

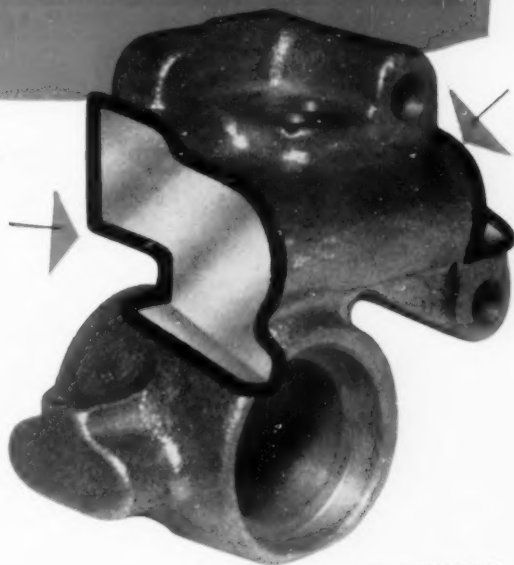
Two parallel surfaces on each of two parts are straddle broached in one pass on this American SB-42-10 single ram broaching machine. Over 350 of these intricate parking brake brackets are completed every hour.

The complete tooling designed the American Way features:

1. Generating type broaches.
2. Fully automatic work holding fixture with tilting table.
3. Automatic clamping and unclamping of parts.

The operator simply loads and unloads the parts, starting each machine cycle by push button control.

For the answer to your broaching problem send a part-print or sample and hourly requirements to American . . . the organization that gives you the extra advantages of experience in producing all three . . . broaches, machines and fixtures. No obligation. Address Dept. T.



For more information on the American SB-42-10 and other American machines, write for Circular #300.



**American** BROACH & MACHINE CO.  
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

**American Building - Ann Arbor, Michigan**

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



SEND FOR YOUR  
**FREE  
COPY**

**NEW  
ACME  
BUSHING  
CATALOG**

Contains  
America's  
**LARGEST  
BUSHING  
Selection**

Features **2** Standards

A.S.A. Standard *Plus*  
Acme Standard

Makes Bushing  
Procurement  
Easy... Fast!  
Send For  
Your  
**FREE  
Copy Now!**



Serving Industry  
For 28 Years

Simplifies, speeds bushing selection.  
Packed with valuable data. Saves you  
time and trouble. Also includes liners,  
leader pins, dowel pins, locating jigs,  
etc.

**ACME  
INDUSTRIAL COMPANY**

208 N. LaSalle St., Chicago 7, Illinois

MANUFACTURERS OF DRILL JIG AND FIXTURE BUSHINGS

USE READER SERVICE CARD; INDICATE A-2-162-1

**SPECIAL SPEED CONTROL!**

**VIKING 13<sup>3</sup>/<sub>4</sub>" ENGINE LATHE**



PROMPT  
DELIVERY

A patented variable speed unit enables the operator to select any  
required speed from 35 to 1200 RPM by the movement of a single  
lever. The headstock is designed with anti-friction bearings and is  
of rigid construction with hardened and ground spindle. All gears  
and spline shafts are hardened to insure long life. Measurements  
are in INCHES AND DECIMALS.

PARTIAL  
SPECIFICATIONS

Distance between centers ..... 30", 40", 60"  
Swing over bed ..... 13<sup>3</sup>/<sub>4</sub>"  
Spindle speeds (RPM) ..... 35-1200  
Motor ..... 3 HP

Write us now for complete details.

**MOREY**  
for machine tools!

**MOREY MACHINERY CO., INC.**  
Manufacturers • Merchants • Distributors  
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CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

Send for complete 1953 catalog, now ready!  
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**MICROFLAT**

**BLACK GRANITE SURFACE PLATES**

Present an absolute continuous bearing surface, finished up to 50 millionths inch. Incredibly smooth. Falling objects do not cause humps. Being harder than hardened steel, can take greatest mistreatment without causing inaccuracy of surface. No oiling. Will not rust or warp. No re-scraping or frequent re-finishing. Can use for spotting and "bluing in."

Immediate delivery in most sizes from 9x12 to 48x144. Request Bulletin and name of Distributor nearest you.



**COLLINS MICROFLAT CO.**

2326 E. 8th Street

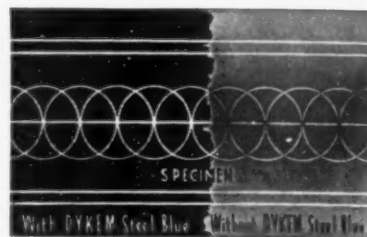
Los Angeles 21, Calif.

USE READER SERVICE CARD; INDICATE A-2-162-3

**DYKEM STEEL BLUE**

**STOPS  
LOSSES**

making dies  
& templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout show up in sharp relief and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

**THE DYKEM COMPANY, 2303D North 11th St., St. Louis 6, Mo.**

USE READER SERVICE CARD; INDICATE A-2-162-4

**Talide**  
(TUNGSTEN CARBIDE)  
**THE WORLD'S HARDEST METAL**

- Many times more durable than steel, it adds years of life to the wearing edges of tools, dies, machinery and equipment.
- Hard as a diamond and almost indestructible, it triples output per man and per machine.
- New heavy-metal alloy (17.5 specific gravity) has proven best for atomic radiation screening and for applications requiring maximum weight in minimum space.

Write for Catalog S2-G  
**METAL CARBIDES CORPORATION**  
YOUNGSTOWN 7, OHIO

Labels in image: CENTERS, BAR STOCK, TOOLS, ROLLS, GAGES, DIAMOND WHEELS AND DRESSERS, HEAVY-METAL, BUSHINGS, BLADES, DIES.

USE READER SERVICE CARD; INDICATE A-2-162-5

The Tool Engineer

Irregularly shaped holes are pierced in this stainless steel jet engine part to very close tolerances—automatically.

More than 40 holes in this automotive frame member are pierced simultaneously.

Cylindrical parts can be pierced (or related operations) from the outside in or inside out using an indexing type machine.

# High Production Piercing...

## IN A SINGLE SET-UP

Seven irregular shaped holes and two trimming operations complete this automobile door inner window frame in one setup. Model changes can be made at little expense.

Based on a recent development in piercing technique, you can pierce more holes simultaneously—faster and with greater accuracy—on Danly Metalworking Equipment. Eliminate awkward multiple handling . . . pierce all holes faster in a simple, single set-up.

Built specifically for your piece part, these are only a few of the advantages of Danly Hydraulic Metalworking Equipment:

### Consider these important features!

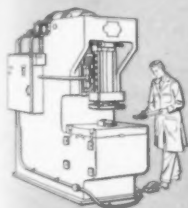
- **HIGH CAPACITY**—Up to 225 tons available per cylinder.
- **BREAKTHROUGH SHOCK PRACTICALLY ELIMINATED**—Permits greater capacity without hydraulic circuit or tool trouble . . . smoother, faster.
- **AUTOMATIC STRIPPING**—An integral feature of every cylinder . . . each station hydraulically strips its punch. This unique action simplifies fixturing, is practically foolproof.
- **ACCURACY, FLEXIBILITY**—Pierces practically any type of hole . . . round, oblong or irregular to very close tolerances.



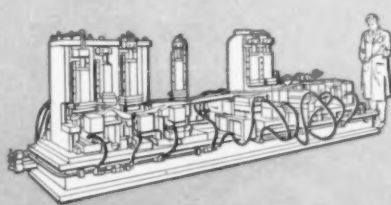
**DANLY MACHINE SPECIALTIES, INC.**  
2100 South Laramie Avenue • Chicago 50, Illinois

HYDRAULIC METALWORKING EQUIPMENT  
MECHANICAL PRESSES . . . 50 TO 3000 TONS

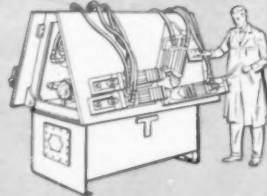
### DANLY HYDRAULIC METALWORKING EQUIPMENT



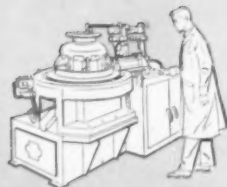
General Purpose Gap Frame Piercing Press



Automotive Frame Piercing Machine



Automotive Inner Window Frame Piercing Machine



Jet Engine Shroud Ring Piercing Machine



# Graph-Mo<sup>®</sup> steel dies produce up to 80,000 parts without throwing burrs!



**T**HE Reliable Tool and Die Company, Cleveland, Ohio, was having trouble with the chromium and carbon dies it used in making small, intricate gears and parts for electric motors and toy mechanical winding motors.

The dies were throwing burrs. The parts often tore when broached. Gear teeth spalled in the dies. And die life was short due to chipping of the cutting edges.

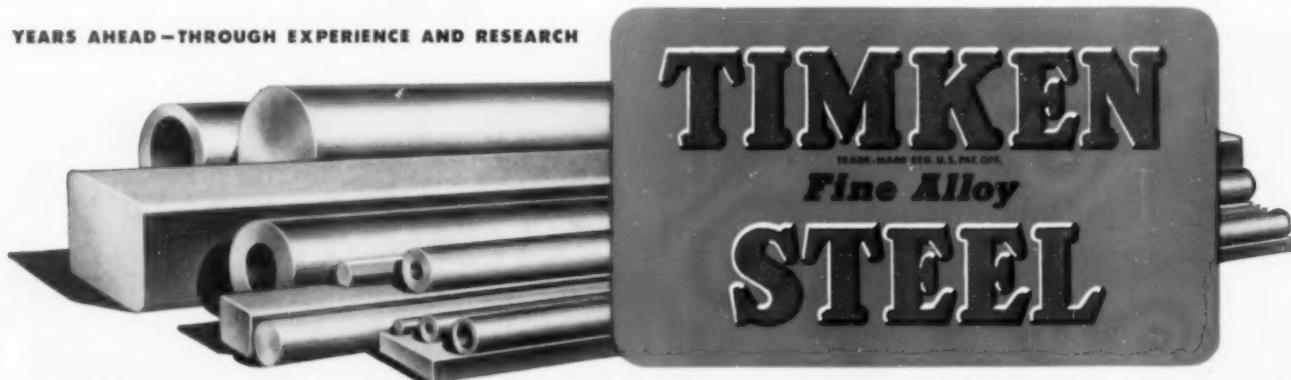
Then Reliable's engineers tried Graph-Mo<sup>®</sup>, one of four Timken<sup>®</sup> graphitic tool steels. The Graph-Mo blanking dies produced as many as 80,000 parts without a single burr. Because of free graphite in its structure, Graph-Mo has outstanding low-friction properties: minimum tendency to scuff, seize, score or gall. Tearing and spalling

were eliminated. And the cutting edges stayed sharp and true because the diamond-hard carbides in Graph-Mo give excellent resistance to wear and abrasion.

Graph-Mo also offers other advantages. It responds uniformly to heat treatment, permitting close tolerances in the parts. It has good stability, and is easier to machine than ordinary tool steels.

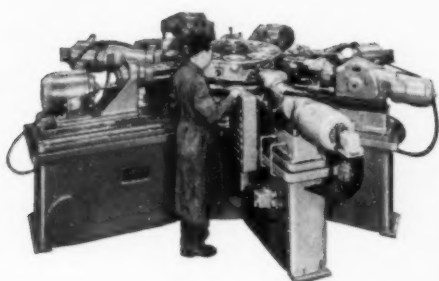
For information on the four Timken graphitic tool steels and their use in punches, dies, gages and machine parts, get the new 10th edition of "Timken Graphitic Steel Data Book". Write on your business letterhead to The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

**YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH**



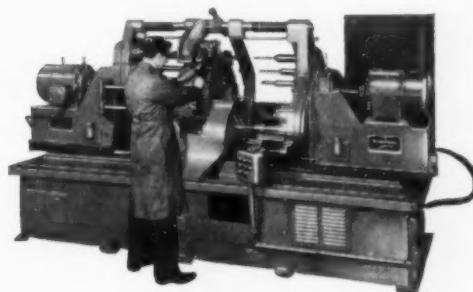
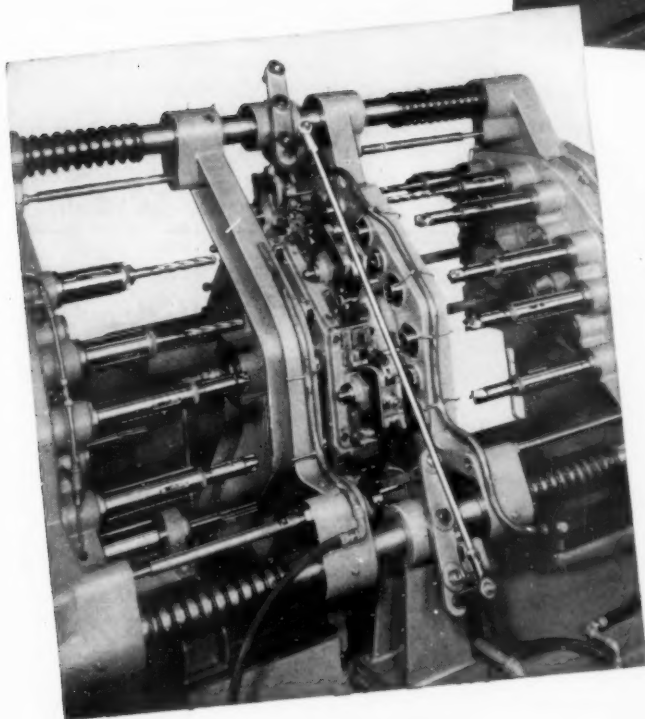
**SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING**

# closeups of drilling & tapping **PRODUCTION**



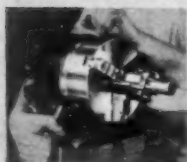
The Hartford Special machine above is drilling, tapping and chamfering side pad holes in compressor rear frames.

The machine at the left, using a vertical dial, is core drilling, rough and finish reaming, rough and finish facing and chamfering two rockers simultaneously.



When it comes to production -

SUPER-  
SPACERS



Automatic  
THREAD  
ROLLERS



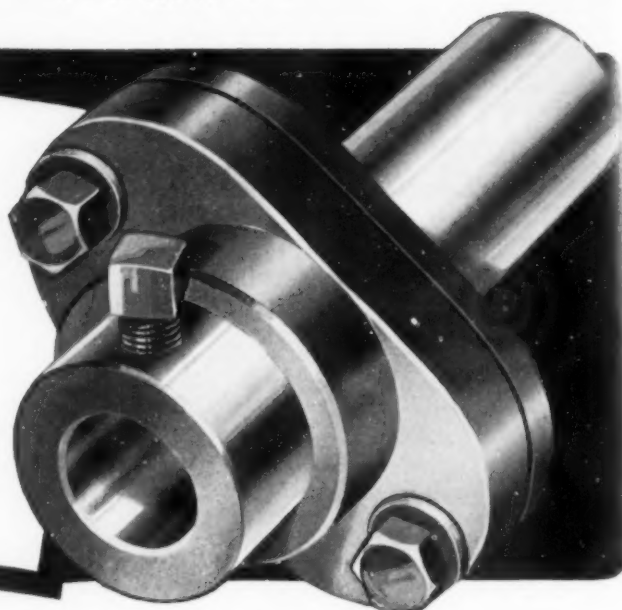
**HARTFORD**  
*Special*

**THE HARTFORD SPECIAL MACHINERY CO., HARTFORD 12, CONN.**

Be sure to see  
the **NEW**

**BOYAR-SCHULTZ**  
MODEL AR  
*Adjustable Tap Holder*  
RELEASING TYPE

25 YEARS SERVICE  
1928 to 1953  
PRECISION MANUFACTURE



Correct alignment of taps between turret and work spindle is quickly possible with this new Releasing Type Tap Holder.

It is available in five sizes, to fit all hand screw machines and turret lathes. Bodies and heads are forged to guarantee utmost strength and durability. It is easily changed for right or left hand tapping. Releasing mechanism is enclosed

for maximum protection of moving parts. It permits accurate control of tapping depth.

The adjustable spindle alignment feature, plus the tool's rugged construction, make this new tool a worthy addition to the constantly growing line of Boyar-Schultz Screw Machine Tools. Actual tests in daily use, prove this new Tap Holder to be the outstanding tool in its field.

**BOYAR-SCHULTZ CORPORATION**

2105 Walnut Street

Chicago 12, Illinois

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-166-1

**INCREASE PRODUCTION..  
SAVE TIME & MONEY**  
ON YOUR  
DRILLING OPERATIONS



**MEYCO**

Carbide Inserted Bushings  
last longer, cost less  
in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.



Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 13



W. F. MEYERS CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-2-166-2

*There's a Walker Magnetic Chuck  
for Every Known Application...*



For sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

Standard Electro and Permanent Magnetic Chucks... Vacuum Chucks... Special Applications for various holding problems... Demagnetizers... Magnetic clutches.

*Original Designers and Builders of Magnetic Chucks*

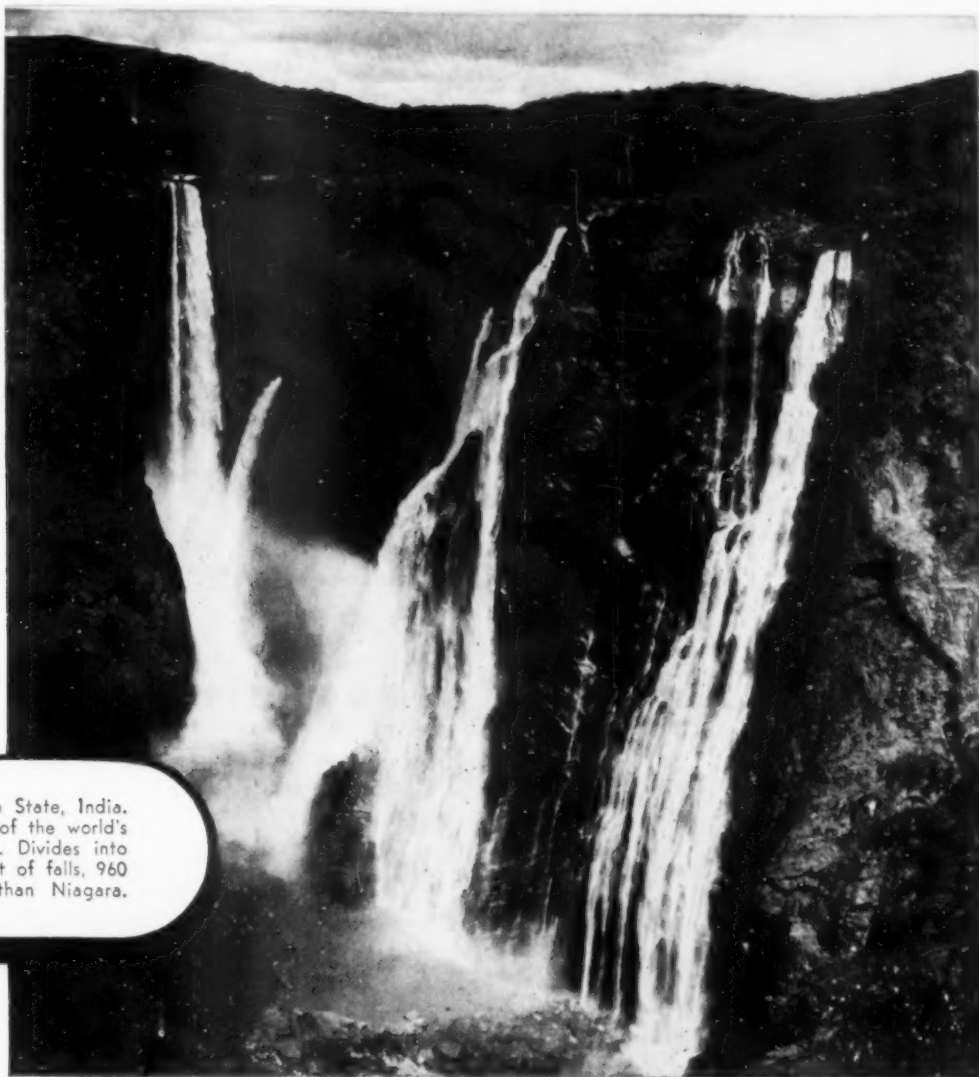
**O. S. WALKER CO. Inc.**

WORCESTER 6, MASSACHUSETTS

USE READER SERVICE CARD; INDICATE A-2-166-3



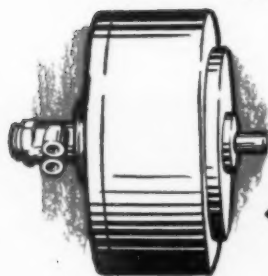
**LOGAN FLUID POWER • DURABLE, DEPENDABLE SINCE 1916**



Gersoppa Falls in Mysore State, India. India's greatest and one of the world's most spectacular wonders. Divides into four separate falls. Height of falls, 960 feet, five times higher than Niagara.

## LOGAN ROTATING AND NONROTATING AIR CYLINDERS

**FAST-ACTING, POSITIVE CONTROLLED POWER . . . AT LOW COST**



Rotating Air Cylinder

### NONROTATING—7 STANDARD MOUNTING TYPES

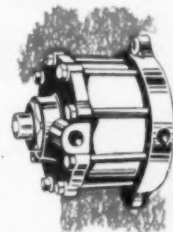
Standard sizes from 1 1/2" to 16" bore; maximum stroke, 18 feet. Special models to meet your requirements.

Logan Features—Larger Ports . . . More Sturdy Construction . . . Maximum Power Without Leakage . . . Permanent Seal Around Piston Rod . . . Standard Models With or Without Cushioning.

### ROTATING

Two Standard Styles—Type R with cast iron body; Type K with lightweight aluminum body.

Bore diameter 1 1/2" to 20"; piston stroke 1" to 2"; longer strokes available as special. American Standard adaptations.



Nonrotating Double-Acting Air Cylinder

Consult Logan for your special heavy-duty, mill-type cylinder requirements

**LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS**  
**FREE CATALOG ON REQUEST**

AIR CONTROL VALVES, Cat. 100-4 • AIR CHUCKS, Cat. 70-1 • AIR CYLINDERS, Cat. 100-1 • AIR-DRAULIC CYLINDERS, Cat. 100-3  
AIR and HYDRAULIC PRESSES, Cat. 51 • COLLET GRIP TUBE FITTINGS, Cat. 200-5 • HYDRAULIC CONTROL VALVES, Cat. 200-4  
HYDRAULIC CYLINDERS, Cats. 200-2; 200-3 • HYDRAULIC POWER UNITS, Cat. 200-1 • SURE-FLOW COOLANT PUMPS, Cat. 62

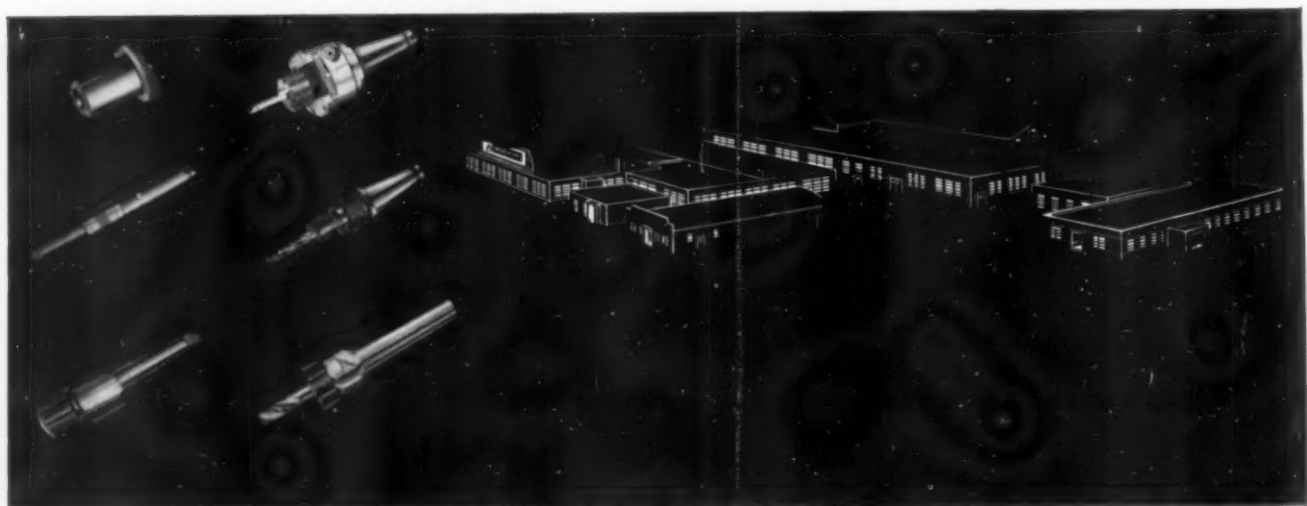


**LOGANSPORT MACHINE CO., INC., 839 CENTER AVE., LOGANSPORT, IND.**



**COMPLETE VARIETY OF  
SIZES AND LENGTHS IN  
UNIVERSAL SUPER FINISHED  
DRILL BUSHINGS**

Check these features that make Universal drill bushings outstanding:  
**1.** Super finish reduces wear to a minimum. **2.** Blended radius reduces tool hang up. **3.** 100% concentricity and hardness tests assure accuracy. **4.** Knurled head provides quick sure grip. Order from the office nearest you ... 1060 Broad St., Newark, N.J., 5035 Sixth Ave., Kenosha, Wis., or write direct to our home office.





*Unretouched Photograph by Morton Berger*

# TAPS *by* CARD

*Performance on the job* is what guides all Card manufacture. For generations, Card has had but one objective — to make the best taps money can buy.

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO.

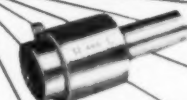


TAPS • DIES • SCREW PLATES

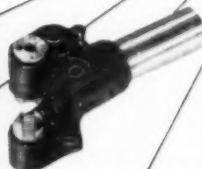


**PRECISION  
WORKMANSHIP  
SPEAKS FOR ITSELF**

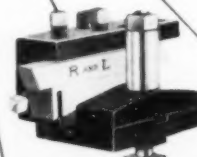
## **R AND L TOOLS**



**TAP AND DIE HOLDER**



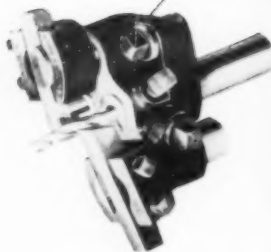
**KNURLING TOOL**



**TOOL POST**



**RECESSING TOOL**



**TURNING TOOL**

Machinists readily recognize the faultless quality of R and L Tools. Constructed of tough, heat treated alloy steel these tools are guaranteed not to bend or give way! Flawlessly ground, R and L Tools provide accuracy and alignment at any point of adjustment! Utmost protection is insured . . . all tools having been tested two years previous to being marketed! Truly, R and L Tools are tools a particular machinist would design for himself.

*Write for complete catalog*

## **RIGHT R and LEFT L TOOLS**

1825 BRISTOL STREET • PHILADELPHIA 40, PA.

*Manufacturers of Precision Screw Machine Tools*

TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL  
RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS

# JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J&L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.

## Some of the reasons why:

**COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS.** J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

**THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING.**

This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

**EASY, CONTROLLED RESHARPENING.** J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.

Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.



**RADIAL CHASER TYPE**  
Capacities from #8 to 4 1/4"

**TANGENT CHASER TYPES**  
Stationary and Revolving. Capacities from #4 to 2"

# JONES & LAMSON

*Machine Tool Craftsmen  
Since 1835*

JONES & LAMSON MACHINE CO., 518 Clinton St., Dept. 710, Springfield, Vt., U.S.A.



**DIE HEAD DIVISION**



## Mark Twain!

### Mississippi Pilots Use Marking Devices

Samuel Clemens adopted his pen name from the expression used by Mississippi River Pilots, such as he, indicating the 2 Fathom Marking Device affixed to their lead lines.



## CADILLAC MARKING DEVICES

are Designed for

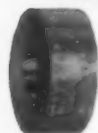
**ALL MARKING PURPOSES**

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.



### CADILLAC 45 HYDRAULIC MARKING MACHINES

Compact, self-contained, manifold mounted. One control gives full range of marking depth. It will mark round, flat and irregular surfaces. Machine capacity is up to 110 one inch impressions per minute.



#### SOLID ROLL DIE

Assuring the utmost in accuracy—used in marking machines, lathes and screw machines.



#### PUNCH PRESS DIE

Faithfully reproduces and is particularly adapted to large production marking.



#### ROLL TYPE HOLDER

Depending on requirements, can be had for either solid or interchangeable type.



## CADILLAC STAMP CO.

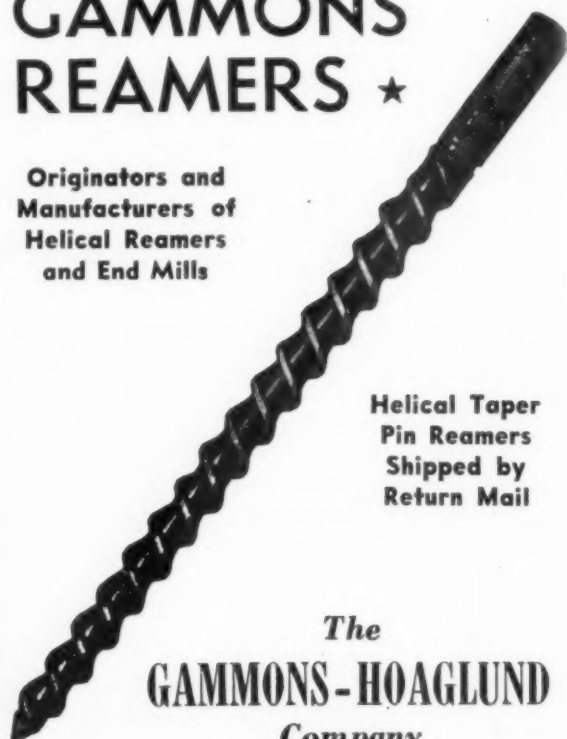
FACTORY and OFFICES

17313 RYAN ROAD • DETROIT 12, MICH.

USE READER SERVICE CARD; INDICATE A-2-172-1

## GAMMONS REAMERS ★

Originators and Manufacturers of Helical Reamers and End Mills



Helical Taper Pin Reamers Shipped by Return Mail

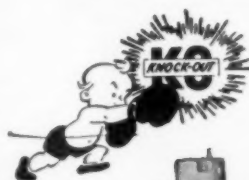
The  
**GAMMONS-HOAGLUND**  
Company

400 Main Street, Manchester, Conn.

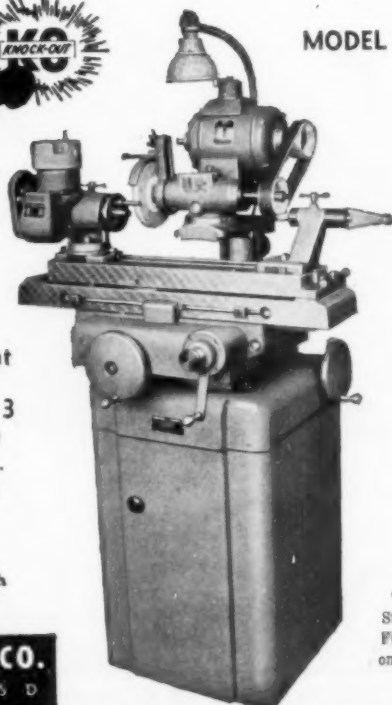
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## There's a reason 76%\*

of all popularly-priced Tool and Cutter Grinders sold in 1952 were "Knock-Outs"



MODEL B860



Will do anything that machines costing 2 or 3 times more will do . . . yes and in less time.

Distributed Only Through Franchise Dealers

**K. O. LEE CO.**

ABERDEEN, S. D.

\*Sales Statistics Furnished on Request

USE READER SERVICE CARD; INDICATE A-2-172-3

The Tool Engineer





# *The Fable of* **The Cat and the Fox"**

**carries a lesson for**  
**Cutting Fluid users**

## *The Fable . . . with apologies to Aesop!*

"I am so smart", bragged the Fox to the Cat, "that I know a hundred tricks to escape a pack of dogs."

"Alas", said the Cat, "I know but one way of escape."

"Poor you, too bad you're not as clever as I am", the Fox answered, scornfully.

Just then a pack of hounds came over the hill headed right for the Cat and the Fox. The Cat took to a tree, its lone, but sure, way of escape. And, the Fox? Despite its hundred tricks of evasion, it was finally caught and killed.

## *The Lesson . . .*

Like the Cat in Aesop's fable, a cutting fluid that best meets a given set of conditions will prove most successful in the long run. A cutting fluid designed to do a hundred jobs may not be the best answer to any. By recommending the

cutting fluids best qualified to meet *your* requirements, D. A. Stuart Oil Co. saves you time, money and materials, gives you the optimum relationship between finish, tool life and output on every machining job.

## **More Than a "Coolant" is Needed**

**D. A. Stuart Oil co.**  
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2727-49 S. Troy St., Chicago 23, Ill.

FILL IN COUPON — CLIP TO YOUR LETTERHEAD

and mail to D. A. Stuart Oil Co. Ltd.  
2727-49 S. Troy St., Chicago 23, Ill.

for your copy of "More Than a Coolant is Needed"

Name .....

Title .....

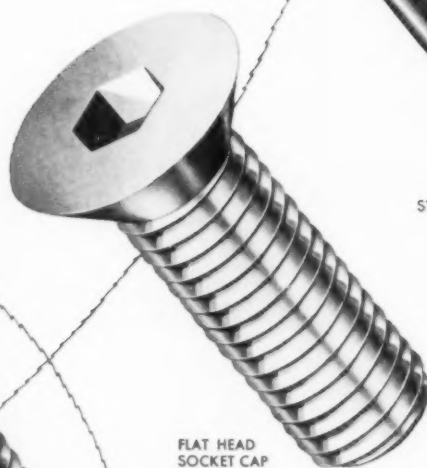
*good judgment calls for*  
**PARKER-KALON®**  
*when good design calls for*  
**SOCKET SCREWS**



SIZE-MARKED  
 SOCKET HEAD  
 CAP SCREWS



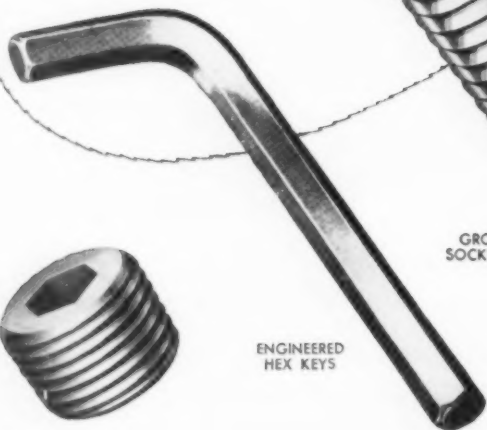
STRIPPER BOLTS



FLAT HEAD  
 SOCKET CAP  
 SCREWS



GROUND THREAD  
 SOCKET SET SCREWS



ENGINEERED  
 HEX KEYS



PIPE PLUGS

**P-K SOCKET SCREW BULLETIN**

16 pages, describes all types, lists sizes, and illustrates quality control back of P-K guarantee. Free on request from your local P-K Distributor. Ask for samples. See why P-K Socket Screws take top honors in any test. Parker-Kalon Corporation, 200 Varick St., New York 14.



# Here's Proof

## The New Thompson Type 2F is a **SUPER PRECISION** Tool Room Grinder



When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

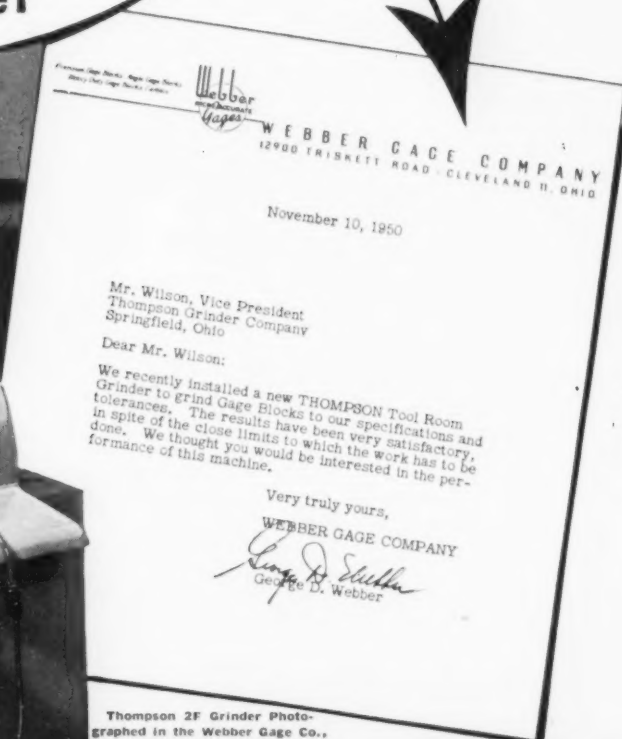
### Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

### Handy control panel.

- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.



## COMPARE THIS NEW **8 x 10 x 24** TOOL ROOM GRINDER

► The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

## Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

February, 1953

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-175

175

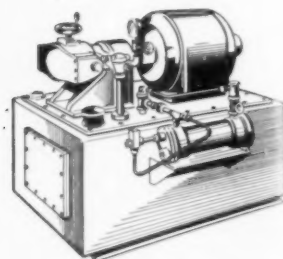




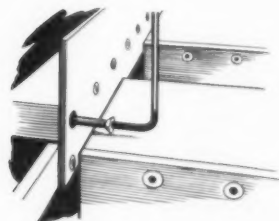
UNBRAKO FLAT HEAD SOCKET CAP SCREWS have the following features: heat treated alloy steel for strength; uniform 82° angle under head for maximum contact;

accurate hex socket for positive, nonslip internal wrenching; fully formed threads—Class 3 fit; standard sizes— $\frac{1}{4}$  to  $\frac{3}{4}$ "—in a full range of lengths.

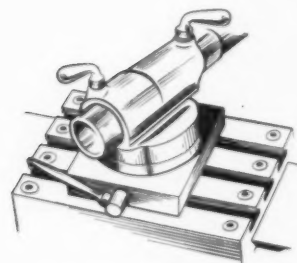
*Our Fiftieth Year*  
A START FOR THE FUTURE



USE UNBRAKO FLAT HEAD SOCKET CAP SCREWS for assembling thin section materials —on piston assemblies, electronic devices and radios.



On sheet metal parts, thin plates, strips and moldings.



On bench lathe milling attachments and other production machinery.

## Why pay much more for a special fastener?

Why pay high prices for a special, when a standard UNBRAKO socket screw will do the job as well. Delivery of a standard is much better, because it is stocked by your local industrial distributor. Write for UNBRAKO Standards. SPS, Jenkintown 37, Pa.

**UNBRAKO**®

SOCKET SCREW DIVISION

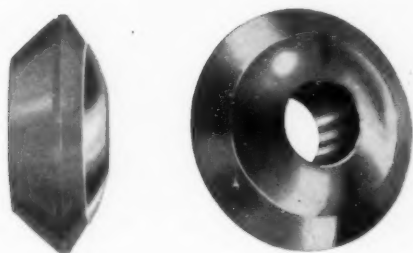
**SPS**

JENKINTOWN PENNSYLVANIA



Write for UNBRAKO Standards

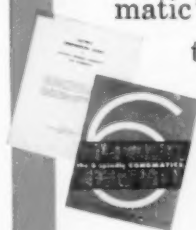
# MACHINING FACILITY IS TANGIBLE



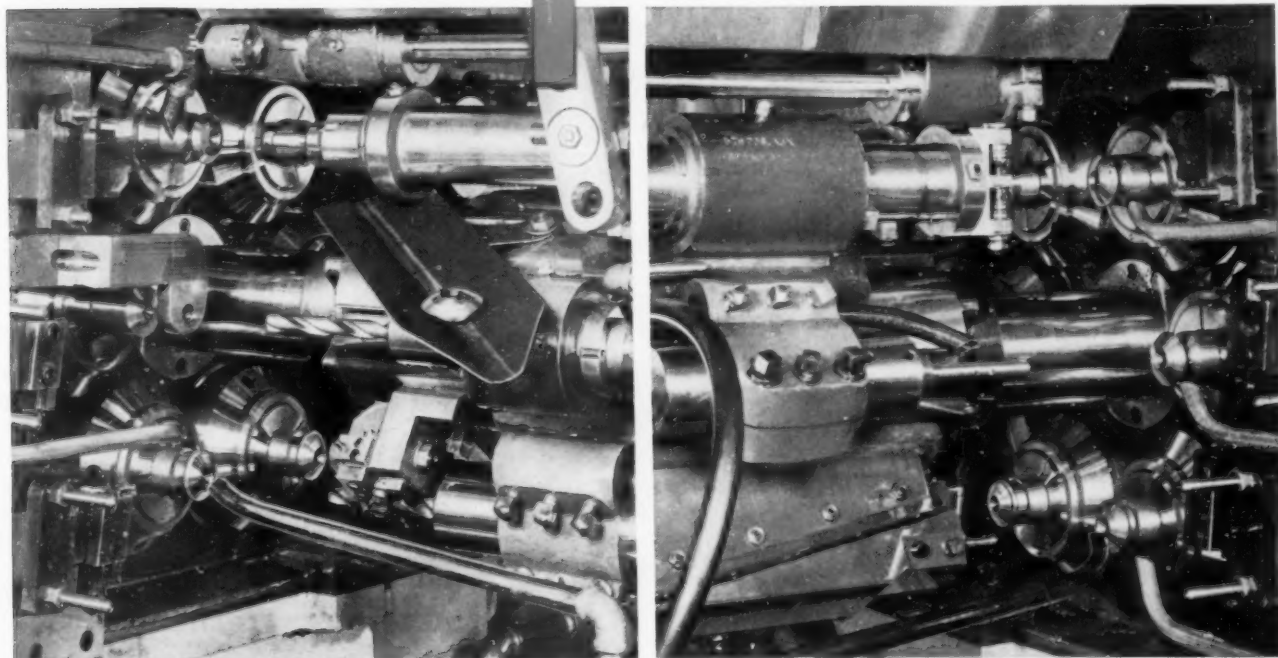
In the production of alloy steel bevel gear blanks on a 2%-SIX CONOMATIC, the "all position" endworking attachment facility simplifies the face and hole burnishing operations.

"AUTOMATICS" are good examples of mechanized teamwork. Their main function is to follow through and keep running. But a weak frame, a cramped tooling area, or an inadequate tool support, of one machine alone, can lower the production average of an entire battery.

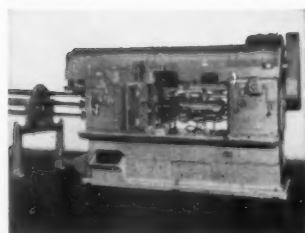
The extra values that pay off in an "automatic" are not just *wished* into the machine; they are *built* there. And only complete information will disclose whether or not they *are* built there. You may have complete information on CONOMATICS.



*A Comparison of ALL Automatics is in favor of Cone*



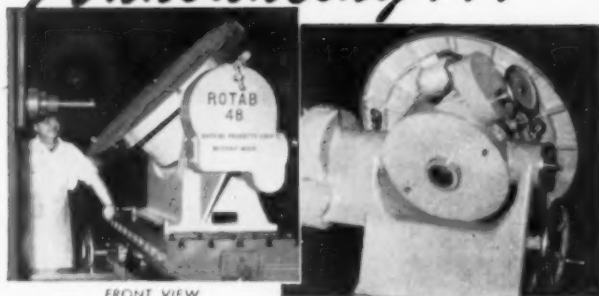
FRONT AND REAR SIDES OF TOOLING AREA



# Conomatic

CONE AUTOMATIC  
MACHINE COMPANY, INC.  
WINDSOR, VT., U.S.A.

*Announcing...*



## The new 48-inch ROTAB

with motor-driven table for fast  
and easy positioning of work

Now a giant ROTAB!—to give you an extra sized table (48-inch) with benefit of motor-drive to position work fast and easily. The table, with 8 tee slots for clamping work, can be rotated by push of button, and locked to any degree to precision accuracy within 2 min. by vernier graduations. Can also be set from vertical to 30° below horizontal the opposite way.

The 36-inch model also available with motor drive. Smaller models—12" and 24"—are set manually.

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### MACHINE PRODUCTS CORPORATION

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DETROIT 12, MICHIGAN

USE READER SERVICE CARD; INDICATE A-2-178-1

SINCE 1901

## MOLINE "Hole-Hog"

SPECIALY DESIGNED  
MACHINE TOOLS

have cut production costs for American Industry.

DRILLING • BORING  
HONING • TAPPING  
and Special Machines

**MOLINE TOOL CO.**  
"Hole-Hog"  
MOLINE, ILLINOIS

**Boring V-8 Engine Cylinders**

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... MAKES THE  
FINEST IN ...  
COUPLING BOLTS  
MILLED STUDS  
CAP SCREWS  
SET SCREWS

*\* Wm. H. Ottemiller co.*  
YORK, PENNA.

Write for name of nearest distributor and our free illustrated folder.

USE READER SERVICE CARD; INDICATE A-2-178-4

an **ACCO** product

J-Model  
"ROCKWELL"  
Hardness  
Tester

### 5 Important "ROCKWELL" Features

1. Totally enclosed, dirt and dust-proof "Zerominder" dial gauge.
2. Gripsel clamp screw for quick change and proper setting of penetrator.
3. All controls grouped conveniently.
4. Enclosed, easy-to-reach, variable speed dash pot.
5. Standardized weights.

These features assure accuracy and ease of operation.

There are two models of WILSON "ROCKWELL" Hardness Testers, plus the TUKON for micro-indentation hardness testing. Write for information.

**WILSON**  
"ROCKWELL"  
and TUKON  
Hardness  
Testers

ACCO  
WILSON MECHANICAL INSTRUMENT DIVISION  
AMERICAN CHAIN & CABLE

230-H Park Avenue, New York 17, N. Y.

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## CUT TOOL COSTS 80%

USE  
ONLY **ONE**  
TOOL HOLDER

This Universal Tool Holder can be used for any lathe, shaper or planer set-up, does internal boring and threading, is ideal for carbide tools. Bit sizes: 1/4", 5/16", 3/8", 7/16", 1/2", 5/8".

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# GRITCLOTH

TOMORROW'S SANDING FABRIC TODAY!

USE WET OR DRY

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NON-CLOGGING

USE BOTH SIDES

No. 320 GRITCLOTH

By Machine or Hand

10 to  
15 TIMES  
LONGER  
LIFE

5" FLAT OR FOLDED

ABRASIVE PRODUCTS  
WESTBORO, MASS.

LONG LIFE

THOUSANDS OF SUPER-SHARP EDGES  
THAT KEEP ON CUTTING

SEND FOR SAMPLE!

**BAY  
STATE**

## ANOTHER SPARKLING BAY STATE "FIRST"!

Once and for all, **GRITCLOTH** solves the age-old problem of clogging sandpaper and other types of coated papers. **GRITCLOTH**'S revolutionary open-mesh design lets the removed particles flow right through, and the sharp abrasive teeth keep right on cutting. Actual tests show 10 to 15 times the life of ordinary coated papers.

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**IT'S NEW      IT'S BETTER      IT'S BAY STATE**

**BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASS., U. S. A.**  
Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh  
Distributors — All principal cities  
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

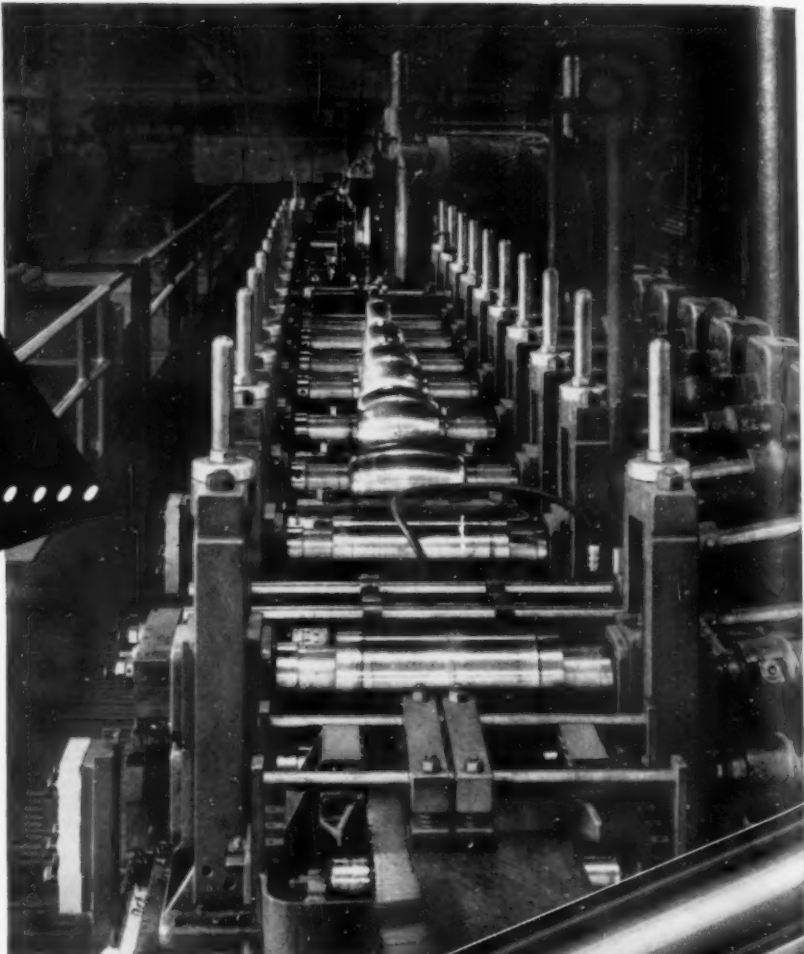
One of several YODER TUBE MILLS recently installed by leading  
Auto Manufacturers—

The Choice  
of a  
TUBE MILL ....

may be governed by a great many factors such as first cost, operating cost, speed, capacity, power consumption, etc. Mechanical and electrical features of the tube forming, sizing and welding units in themselves must be carefully examined. However, no matter how necessary or important all such details may be—or how effectively they may be presented—the most convincing proof of superiority is obtained by a comparison of tonnage production, consistently maintained over the years, of high quality tubes.

Fortunately, most electric weld tube mills are chosen that way. This fact, above all others, explains why the vast majority of such mills installed in the U.S.A. are built by Yoder.

List of Yoder tube mill installations sent on request. Also literature discussing the economics as well as the mechanics of tube making.



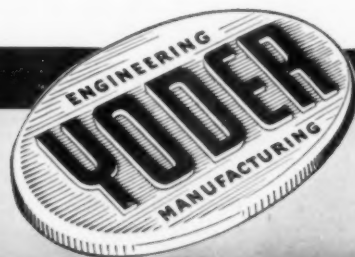
### THE YODER COMPANY

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#### Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS—cold forming and welding



The  
***Number One***  
name in socket screws..

**ALLEN**

*with design engineers...*

***No. 1***

because Allen's greater strength, greater holding power and freedom from projecting heads permit more compact design and smooth, safe surfaces.

*on the production line...*

***No. 1***

because Allen O Heads' superior uniformity is maintained by statistical chart control. Burr-free threading and keying speed assembly time.

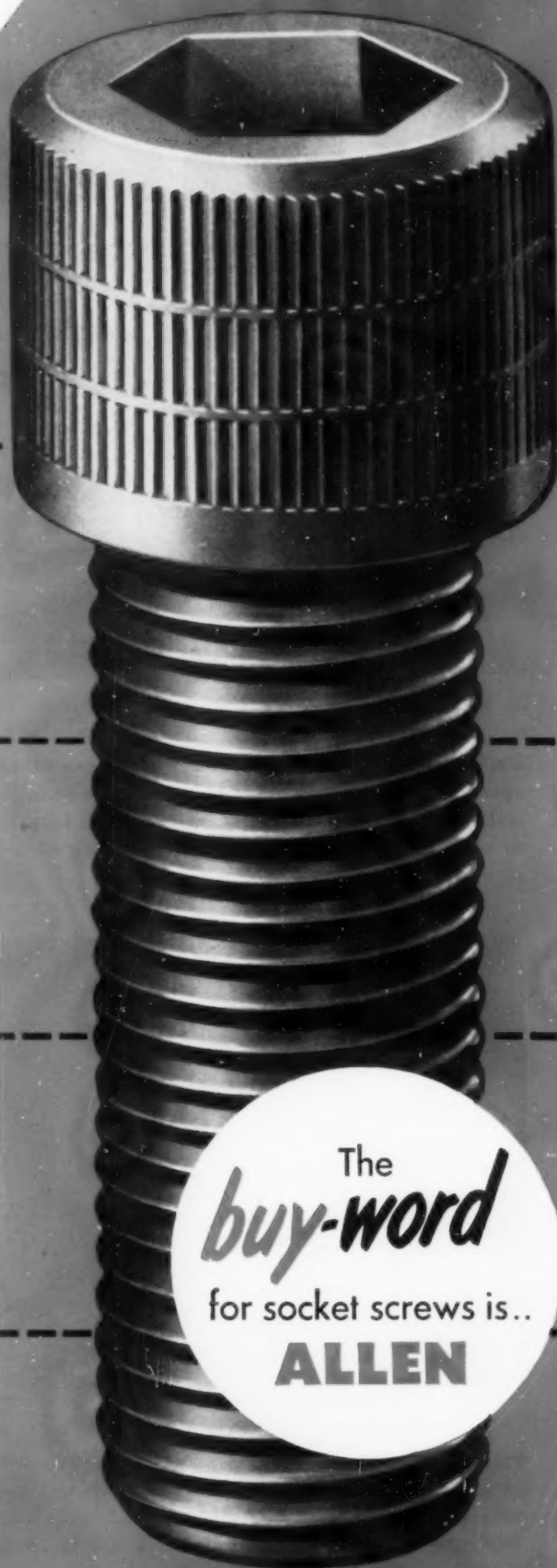
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because Allen O Screw products identify equipment that is designed right, built right. Allen screws, with more durable threads and sockets make adjustments, disassembly and reassembly easy and trouble-free.

... Sold only through leading distributors.

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The  
***buy-word***  
for socket screws is..  
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# MORE POWER

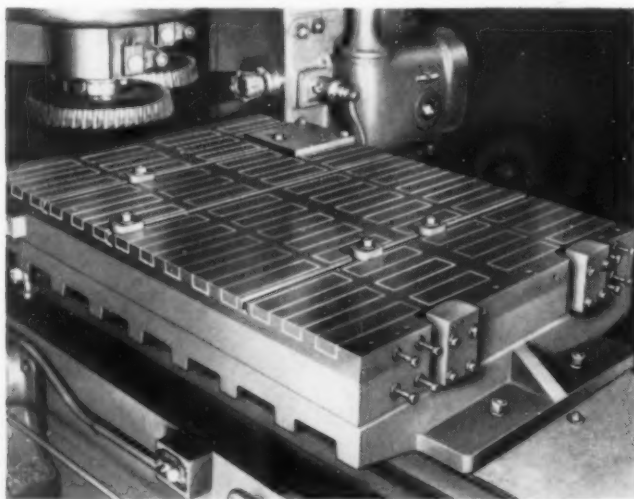
**...IN LESS SPACE!**

*with Taft-Peirce SUPERPOWER Magnetic Chucks*



#### T-P SUPERPOWER RECTANGULAR CHUCKS

Pack *more* power in less space to increase versatility, speed, and safety of setups. Also available in fine mesh styles for securing extremely small or thin sections . . . or with longitudinal pole pieces for holding wide range of work-sizes.



#### T-P SPECIAL SUPERPOWER CHUCKS

55½" x 40" chuck shown holds cast iron loomsides on a 75 HP milling machine, while three 18" carbide cutters and two 4" face mills take ¼" cuts simultaneously . . . at 30" per minute! Its greater holding power, smaller size, and high efficiency are typical of all T-P Superpower designs — whether special or standard models.



#### T-P SUPERPOWER SINE ANGLE CHUCK

Speeds positioning of tricky angle grinding jobs. Gage blocks placed between roll and base plate assure high precision of compound angle setups. Typical of the wide range of Taft-Peirce adjustable magnetic chucks built to help make accurate setups faster.

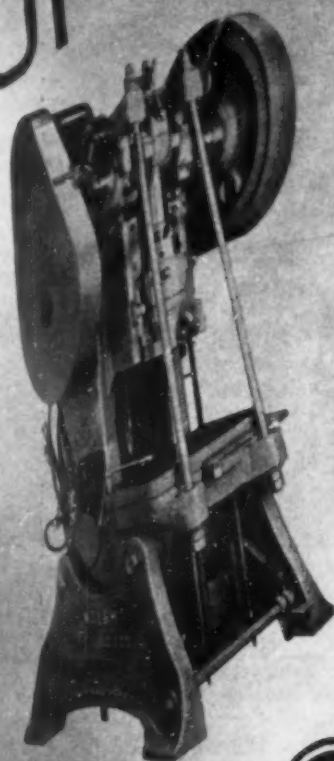
*For the complete story on these items and many more, get your copy of the New Taft-Peirce Handbook.*



*T-P means  
Top Precision*

**THE TAFT-PEIRCE MANUFACTURING COMPANY**  
Woonsocket, Rhode Island

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## WALSH ENGINEERING SERVICE

With a stamping problem, just send a sample or blueprint of the part to the WALSH Engineering Department. You will receive an analysis giving complete specifications for the most efficient and economical equipment. There is no obligation to buy equipment from WALSH. This counseling service is free to the metalworking profession.

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SINCE 1907

## WALSH PRESS & DIE CO.

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AMERICAN GAGE & MACHINE COMPANY  
WALSH PRESS & DIE CO.  
PUNCH PRESSES

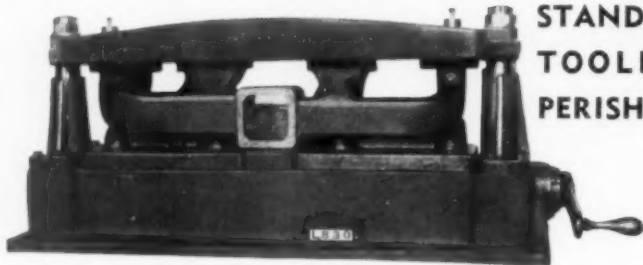
SIMPSON ELECTRIC CO.  
ELECTRICAL INSTRUMENTS

SIZE CONTROL CO.  
MILWAUKEE, WIS.

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W. W.		
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# A CAPITAL INVESTMENT



STANDARD DRILL JIGS LOWER SUBSEQUENT TOOLING COSTS. THEY ARE NO MORE PERISHABLE THAN YOUR MACHINE TOOLS.

## PROPOSAL L-830

Drilling flange holes in automobile motor manifold. The lower adapter is designed to support the four flanges and automatically compensate for the variations in castings. A Swartz lock holds the clamping action. The standard jig can be used again as tooling becomes obsolete.

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WRITE FOR CATALOG 941

## SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Ave.

Phone WE 3-1522

Detroit, Michigan

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-184-1

**Machine de-burring  
with NOBUR  
pays BIG production dividends!**

NOBUR Tools turn a slow bench operation into fast and efficient machine work! Remove burrs on multi-walled parts with a smooth, clean cutting action that won't mar highly finished surfaces. Eliminate rejects from slow, costly hand work with files, scrapers and abrasives.

Nobur Tools are used on any lathe, drill press, portable drill or flexible shaft. Operation of the double-edge cutting blade is easy and safe... no skilled help is required, and the spindle never needs to be stopped for either de-burring or chamfering.

Nobur Tools cut freely on either hard or soft metals, are simple in construction and are made in sizes to cover a full range of hole diameters. \*NEW "DS" SERIES extends range of NOBUR applications to holes as small as 1/8" diameter. WRITE FOR FULL DETAILS TODAY!

Parts like these quickly de-burred with-

**NOBUR TOOLS**  
NOBUR MANUFACTURING COMPANY  
717 N. VICTORY BLVD., BURBANK, CALIF.

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## **Buol** HELICAL SPIRAL TAPER PIN REAMER

featuring

Continuous change in lead angle to compensate for continuous change in diameter.

- This feature insures uniform depth of radial undercut (shear) on the entire length of the taper and provides uniform relief at all points on the diameter.
- In stock for immediate delivery sizes #6/0 thru #10. Made promptly to order sizes #11, 12, 13, and 14.
- Backed by 27 years of manufacturing reamers exclusively. We also make Stub Reamers, Die Clearance Reamers, and Special Reamers to your exact specifications.

MANUFACTURERS' AGENTS: Exclusive territories open outside of New England and metropolitan New York. Write us.

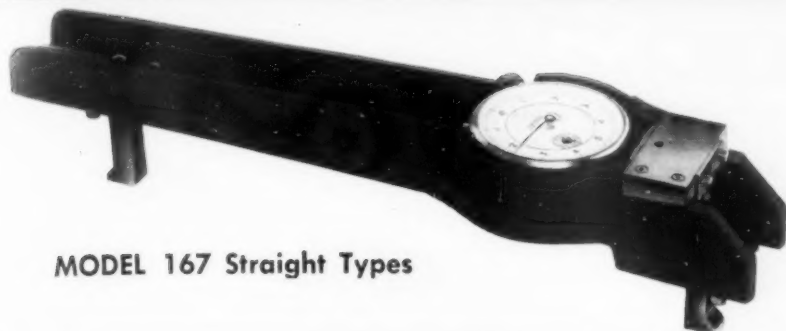
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REAMERS EXCLUSIVELY  
PARK & MEADOW NEW BRITAIN, CONN.

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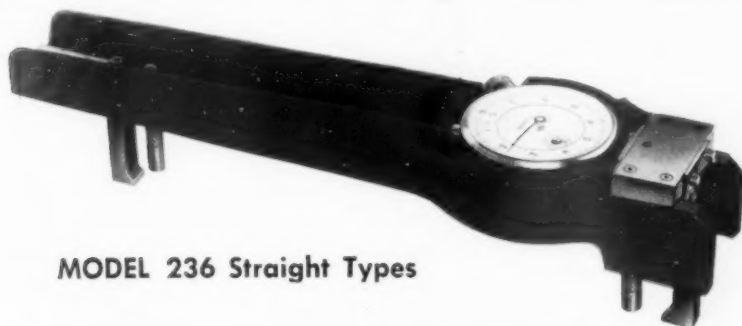
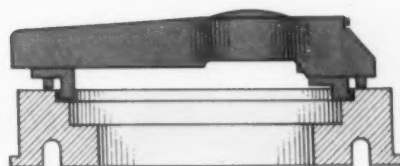
*Here's the Answer  
for Inspecting*

## SHALLOW DIAMETERS



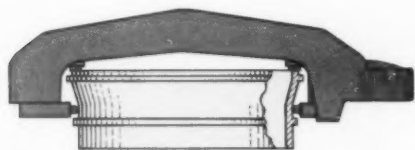
MODEL 167 Straight Types

either **INSIDE**

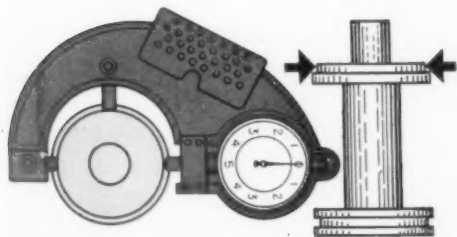


MODEL 236 Straight Types

or **OUTSIDE**



**Humped Types**  
Inside or Outside



**"C" Types**  
Inside or Outside

Checking the accuracy of a diameter on a shallow shoulder or similar section is often a problem, especially if the diameter is large in comparison with the surface being measured. (See sketches.) With these Shallow Diameter Gages, however, it's easy to get fast, accurate checks.

"Locating" contact points help to position the gage parallel to the flat surfaces of the workpiece so the actual diameter is read perpendicular to the axis of the workpiece. Both inside and outside diameters, and diameters at various depths, are checked positively and accurately.

For checking workpieces having projections which would interfere with Straight Type Gages, the Humped Types are recommended. For measuring similar dimensions remotely located from either end of the workpiece, "C" Type Gages are the answer. Let us know your requirements. Federal Products Corporation, Providence 1, Rhode Island.

**FEDERAL PRODUCTS CORPORATION • 1192 Eddy St., Providence, R. I.**  
Please send me information about the following:

☐ Model 167   ☐ Model 236   ☐ Humped Types   ☐ "C" Types  
Straight Types   Straight Types

Sketch ☐ Blueprint ☐ is enclosed showing dimension we wish to gage.

Name \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

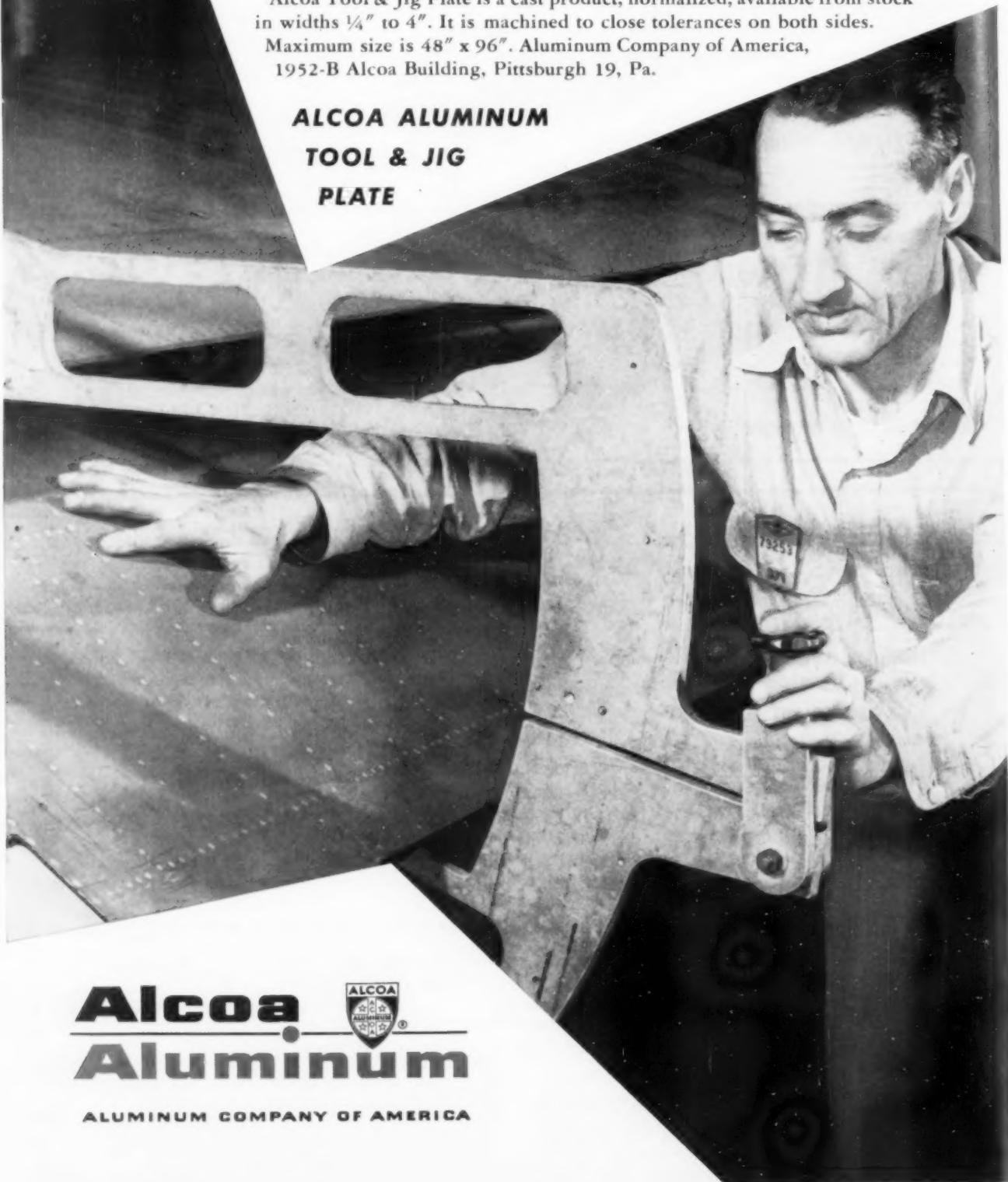
**FEDERAL**  
Largest manufacturer devoted exclusively to designing  
and manufacturing all types of DIMENSIONAL INDICATING GAGES

**This Jig is easy to handle** because it is made of aluminum (Alcoa Aluminum Tool & Jig Plate). It also costs substantially less than if it were made of steel because material costs are lower, and machining is faster.

Many manufacturers are using Alcoa Tool & Jig Plate for assembly and machining fixtures, dies for low-pressure molding of rubber and plastic, and dies for forming aluminum sheet.

Alcoa Tool & Jig Plate is a cast product, normalized, available from stock in widths  $\frac{1}{4}$ " to 4". It is machined to close tolerances on both sides. Maximum size is 48" x 96". Aluminum Company of America, 1952-B Alcoa Building, Pittsburgh 19, Pa.

**ALCOA ALUMINUM  
TOOL & JIG  
PLATE**



**Alcoa**  
**Aluminum**



ALUMINUM COMPANY OF AMERICA

# U N I O N



*Unretouched Photograph  
by Morton Berger*

*Perfectly designed for its job . . . .*

Union's long experience in the cutting tool field reflects itself in the excellent performance of every tool it makes.

**UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS**

**Milling Cutters   Gear Cutters   Twist Drills   Hobs   Reamers   Carbide Tools**

**OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass. TAPS, DIES, SCREW PLATES**

**BUTTERFIELD DIVISION, Derby Line, Vermont DRILLS, TAPS, DIES, REAMERS, COUNTERBORES, SCREW PLATES**

**BUTTERFIELD DIVISION, Rock Island, Quebec MILLING CUTTERS, TWIST DRILLS, HOBBS, REAMERS, TAPS, DIES, SCREW PLATES**

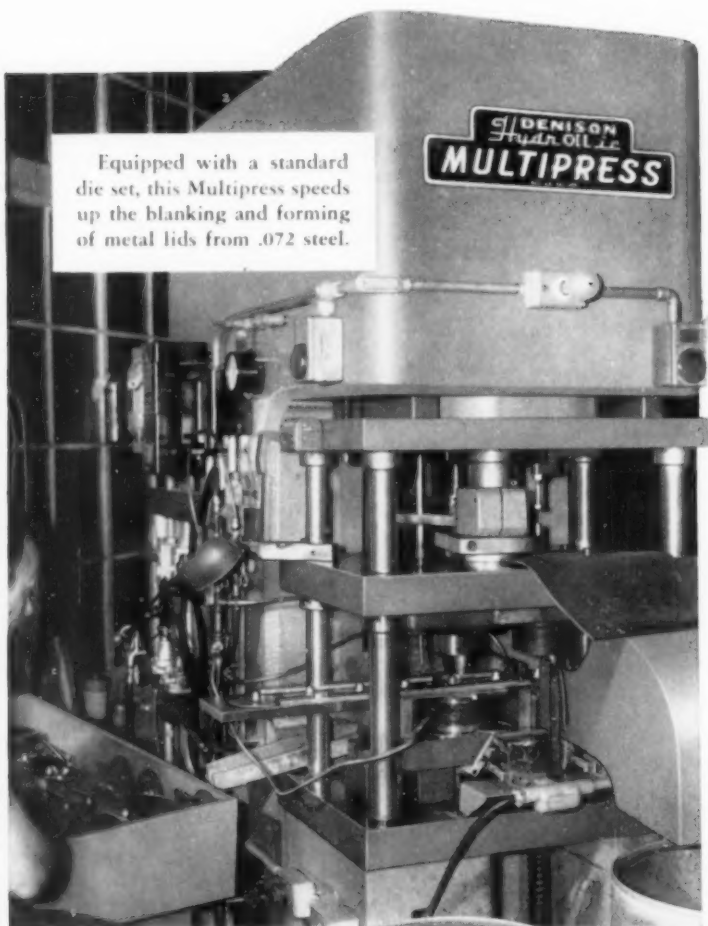


# "Blanking and Forming



with

## MULTIPRESS®



Equipped with a standard die set, this Multipress speeds up the blanking and forming of metal lids from .072 steel.

Multipress offers *lower* impact on dies . . . *lower* ram velocities.

Exact control of press tonnage cuts die wear, permits more grinds per die.

Infinitely adjustable ram stroke, plus easy inching action permits quicker die changes.

Fully adjustable tonnage, ram speed, and stroke length adaptable to a wider range of work.

Multipress offers one-ton to 50-ton capacities . . . eight frame sizes . . . bench and floor models . . . maximum accessibility for special tooling and auxiliary equipment.

Standard Multipress accessories available for many specialized production needs.

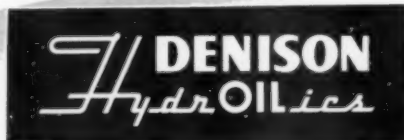
*Write today for full information on Multipress.*

## See it in Action

Denison's newest film, "Blanking & Forming with Multipress" brings you 10 minutes of fast action on several actual production jobs . . . shows the *how* and *why* of methods and principles . . . highlights important press control features — and gives you a close look at the fastest hydraulic press operation you've ever seen. Your Denison Multipress representative can show you this new 16mm sound film now, or you may write direct to —

**The DENISON Engineering Company**

1191 Dublin Rd., Columbus 16, Ohio



1,815 STANDARD GAGES ARE AVAILABLE FROM SIZE CONTROL

*stock to 4 week delivery  
many items  
immediate delivery*

2,000,000 blanks are in stock at all times for plain and threaded plug gages—reversible and taperlock—ring gages and snap gages.

New equipment and old engineering together serve you with an *in stock* delivery cycle on *made to order* items, the same engineering that originated the Size Control Centerless Lapper and reversible threaded plug gages—and revolutionized the manufacture of *all* precision gages.

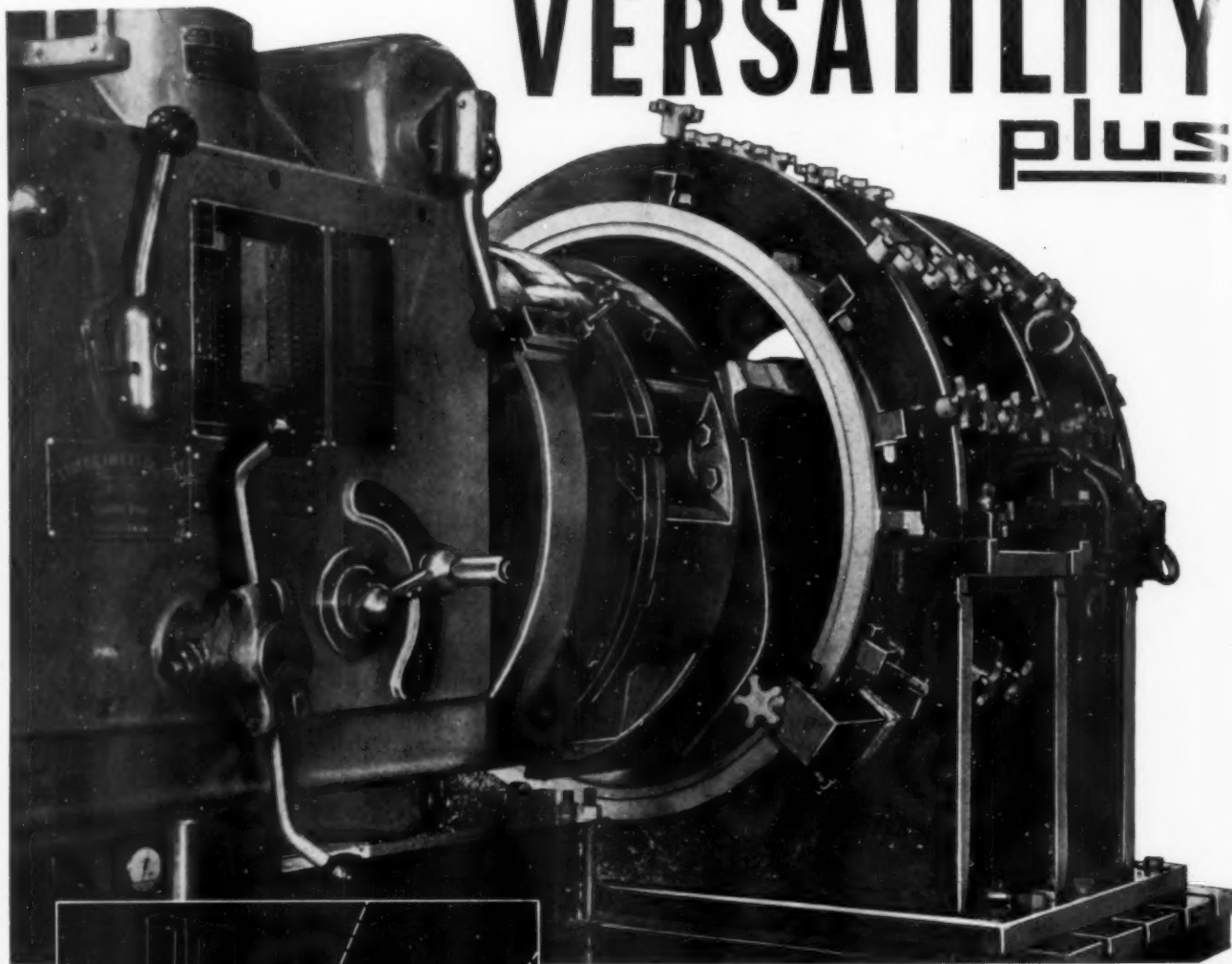


**SIZE control company**

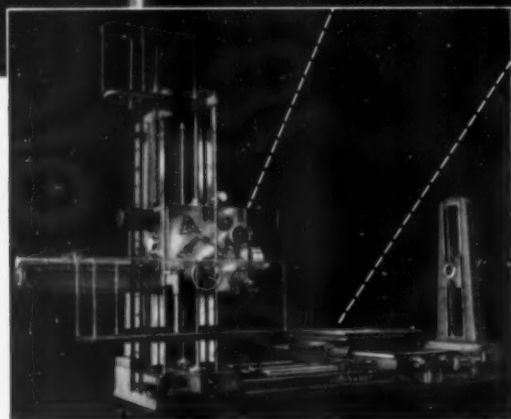
DIVISION OF THE AMERICAN GAGE & MACHINE COMPANY  
2500 W. WASHINGTON BLVD. • CHICAGO 12 • MONROE 6-6710

**S  
C**

# VERSATILITY plus



PATENTS PENDING



**GILLY** HORIZONTAL BORING and  
MILLING MACHINES  
Table Models from 2 9/16" to 6" Spindle • Floor Models from 5 1/8" to 8"

Rugged—Fast—Highly Accurate, with many outstanding features such as:

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- Boring and grooving jet-engine compressor casings posed many problems, due to their thin wall sections, large size, and high accuracy requirements.
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& CO., INC.**

95 MADISON AVENUE, NEW YORK 16, N. Y.



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...with  
these three  
cost-reducers

**1** Entire length Kolorkoted for permanent, quick-as-a-glance identification... eliminates confusion.



**2** Heat treat card of color to match Kolorkote on steel goes with every shipment... eliminates errors.



**3** Hollow Die Steels with smooth finish inside and out, no scale, no decarb... minimize machining, reduce waste. Saw cut to length.



## MILNE'S Kolorkoted TOOL STEELS

HOLLOW  
HOLLOW DIE  
SIZES

16" OD x 12" ID  
TO  
2" OD x 1" ID  
Rough Turned  
Rough Bored



SOLID  
SOLID TOOL STEEL  
COMPLETE RANGE  
OF SIZES & GRADES  
ROUNDS • FLATS  
SQUARES

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HI-CARBON HI-CHROME  
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"GRAY"  
JIC A1

**B** ORANGE LABEL  
WATER HARDENING  
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Est. 1887

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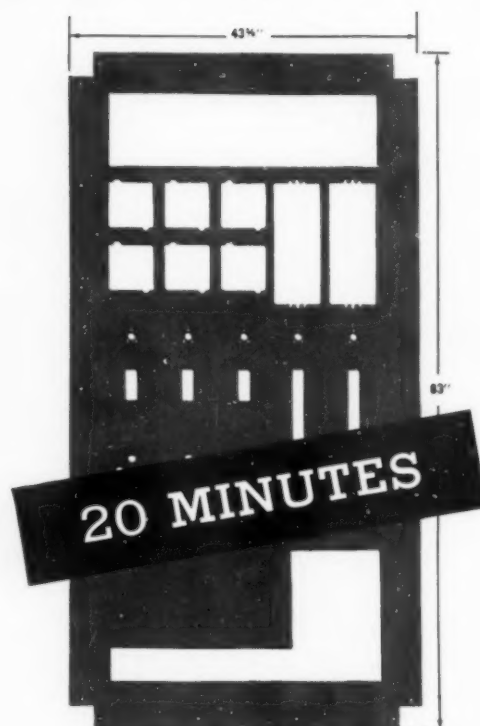
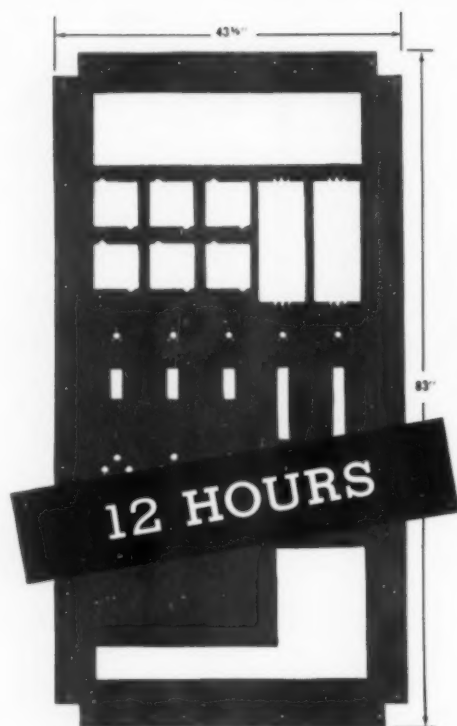
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Established 1887

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America's Leading Tool Steel Specialists  
Complete Line Of Tool Steels—Hollow and Solid

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On production of switchgear panels in lots of 1 to 10 of a kind, Penn Electrical Co., Irwin, Pa., reduced handling operations from 11 to 1, and eliminated layout and set-up time.

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*New Counterbore*  
with interchangeable pilots



*Photograph by Morton Berger*

Introducing the Butterfield High Speed Counterbore and Spot Facer  
in standard and aircraft designs . . . latest example of  
Butterfield craftsmanship. Ask your distributor.

**B U T T E R F I E L D**

Union Twist Drill Company **Butterfield Division** Derby Line, Vermont, U. S. A.

DRILLS • TAPS • DIES • REAMERS • COUNTERBORES • SCREW PLATES

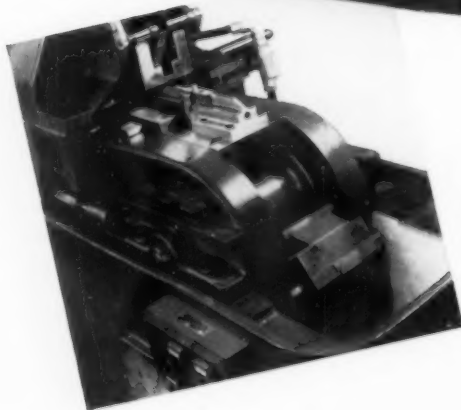


# ***COST REDUCTION*** thru faster, continuous broaching of multiple parts

● Wherever metal is removed on duplicate small parts you are apt to find a place where Footburt Surface Broaching Machines can cut manufacturing costs. Production is high, and tool maintenance is low in cost per piece. We have had many years of experience in designing the tooling for various types of parts and will gladly advise you in applying surface broaching to your work.

**THE FOOTE-BURT COMPANY • Cleveland 8, Ohio**

Detroit Office: General Motors Building



● Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.



# **FOOTBURT**

*machine tools*

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# 138

## MODELS FOR EVERY NEED!



offered in  
1500 P.S.I.—3000 P.S.I.  
for most models

Four types of action  
—standard, spring  
return, spring centered,  
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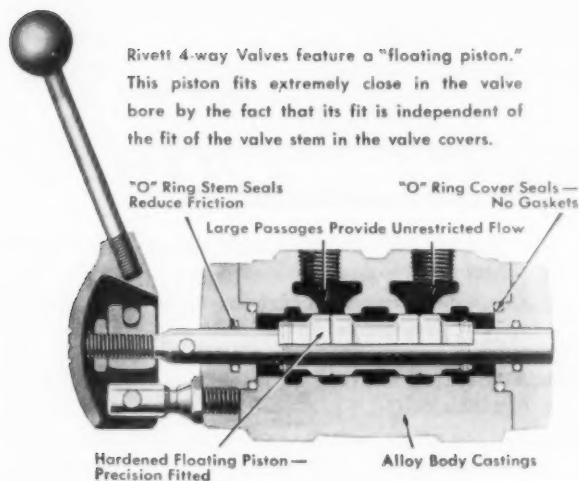
Five piston designs  
to meet the requirements  
of any circuit



Six types of operation  
—hand, foot, cam,  
solenoid, oil pressure,  
air pressure



Seven sizes available  
— $\frac{1}{4}$ ",  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ ",  
1",  $1\frac{1}{4}$ ",  $1\frac{1}{2}$ "



Rivett 4-way Valves feature a "floating piston."  
This piston fits extremely close in the valve  
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the fit of the valve stem in the valve covers.

You can plan a more efficient hydraulic circuit by  
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tributors, who will assist in laying out the circuit  
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# RIVETT

furnishes a complete power package

VALVES • CYLINDERS • POWER UNITS



Air and Hydraulic  
All sizes and types

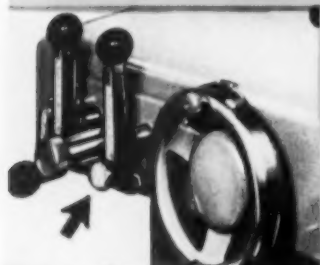
# NOW... A GREAT



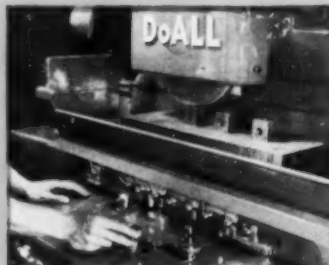
D-6 Models—6" x 18" and 6" x 24" sizes. Manual and hydraulic operation—7" wheels.



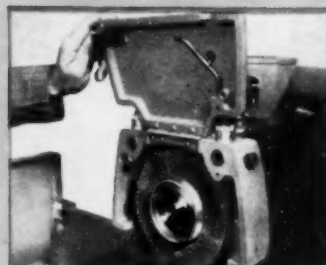
D-8 Models—8" x 24" with 10" or 14" wheels. Manual and hydraulic operation.



Variable speed wheel dressing feed.



Skip feed for intermittent plunge grinding.



New flood and "Cool-Grind" system.



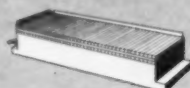
High speed spindle, vertical or horizontal.

## ATTACHMENTS and ACCESSORIES

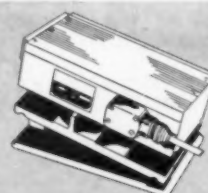
1. **Coolant System**—"Cool-Grind" (coolant through the wheel) or flood grind, or both simultaneously.
2. **Coolants** for every job.
3. **New Laminated-top Magnetic Chuck.**
4. **Magnetic Sine Chuck**—for fast easy setups on single or compound angle work.
5. **Selectron**—for controlling magnetic chuck holding power—and demagnetizing.
6. **High Speed Spindle Attachment Vertical or Horizontal**—provides speeds up to 20,000 RPM, for use of very small wheels.
7. **Variable Spindle Drive**—electronic control provides infinitely variable speeds.
8. **Crush Dresser Spindle Drive**—slow-speed drive for wheel crushing.
9. **Crush Grinding Attachment**—provides steady table speeds down to 1" per minute—includes heavy duty spindle.
10. **Adjustable Crush Roll Idler Stand**—permits tilting of crush rolls.
11. **Motor-Driven Crush Roll**—for forming grinding wheel or crush rolls.
12. **Automatic Downfeed**—can be set to feed at each reversal, or alternate reversals of table.
13. **Automatic Skip Feed**—table travel speeds up between multiple work pieces when plunge grinding.



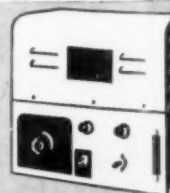
BAND MACHINES



MAGNETIC CHUCK



SINE CHUCK



SELECTRON



# NEW

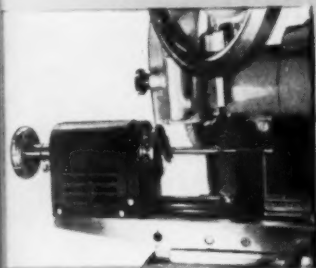
# LINE OF DoALL

## Precision

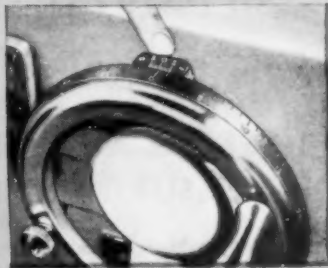
# SURFACE GRINDERS



D-10 Models—10" x 30" chuck with 10" or 14" wheels.



Cylindrical grinding and indexing attachment.



Slip rings for zeroing hand-wheels.

14. Fully Automatic Surface Grinding—controls cross-feed and downfeed automatically.
15. Cylindrical Grinding Attachment—for straight and taper cylindrical grinding and indexing.
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18. Universal Vise—completely adjustable for holding work in any position.
19. Set of Plain Centers.
20. Wheel Balancing Stand and Arbors.
21. Grinding Wheels.
22. Complete Electrical Panel Remote Control Systems.

- ★ NEW SIZES—including 6" x 24" and 10" x 30".
- ★ NEW 12½" WORK HEIGHT CAPACITY.
- ★ NEW SPEEDS—up to 100 fpm table travel.
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- ★ NEW RIGIDITY AND STURDINESS.
- ★ NEW ATTACHMENTS AND ACCESSORIES.
- ★ NEW CONVENIENT CONTROLS.
- ★ NEW FULLY AUTOMATIC OPERATION.
- ... and more!

NEW DoALL Surface Grinders will handle an unlimited variety of surface grinding, cylindrical grinding and form grinding jobs with a heretofore unattainable combination of precision and speed.

You have to see them perform to visualize their capabilities. Ask to have a free demonstration in your own plant. Call your local DoALL Sales-Service Store, or write:

**THE DoALL COMPANY**  
254 N. Laurel Ave. Des Plaines, Ill.

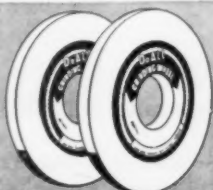


## NEW CATALOG

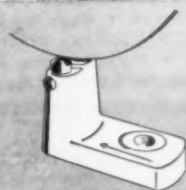
Free. Complete data and description of DoALL Grinder design and construction—coolant systems—controls—automatic setups—attachments. Ask for your copy.



COOLANTS



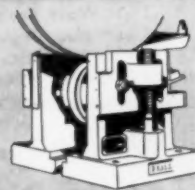
GRINDING WHEELS



DIAMOND DRESSER



DUST COLLECTOR



CRUSH ROLLS



GAGE BLOCKS



# THE *Van Keuren* GEAR MEASURING SYSTEM

Set 26EX-Gear Measuring Wires, accurate to  $\pm .000025''$ ,  
for common diametral pitch external spur gears.

**VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.**

**ONLY...**

**EQUIPMENT NEEDED: 1-SET VK MEASURING WIRES  
1-MEASURING INSTRUMENT**

**Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 35. Included in this section are:**

- table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series
- tables of wire measurement including change factors for standard external and internal spur gears of  $14\frac{1}{2}^\circ$ ,  $17\frac{1}{2}^\circ$ ,  $20^\circ$ ,  $25^\circ$ , and  $30^\circ$  pressure angles and of from 5 to 500 teeth.
- table of relationships between depth of cut and tooth thickness for common pressure angle gears.
- definitions and exact formulas covering involute spur gears.
- tables of involute tooth parts for standard addendum and stub tooth involute gears.
- information, formulas and examples regarding the wire measurement of helical gears.
- information and examples concerning the wire measurement of enlarged pinions and reduced gears.
- tables of wire measurement for involute splines.
- tables of wire measurement for involute serrations.
- tables of comparative measurement over three sizes of wires for use in involute profile checking.

**CATALOG and HANDBOOK No. 35 is available without charge by writing to:  
The Van Keuren Co., 174 Waltham St., Watertown, Mass. Ask for your copy.**



THE *Van Keuren* CO.,

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## "Desegatized" Tool Steels



"Mr. Big" - being completely free of harmful carbide segregation is proof that a positive control exists for eliminating segregation.

"Mr. Big" could not be produced to the same high quality standards by any process other than the "DESEGATIZED" process.

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They are especially designed to withstand and absorb the shocks that can't be avoided in machining. They're as near frictionless as we can make them.

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Inasmuch as we manufacture cams and tools for the trade we obviously do so on a production basis. As a result we offer:

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All Delivery Promises Are Dated From Our Receipt of Complete Information At Our Plant

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Protects Against Scratch-Damage, Wear and Rust



**DIRT WIPER SEALS**

Protect Rods, Seals, Bushings



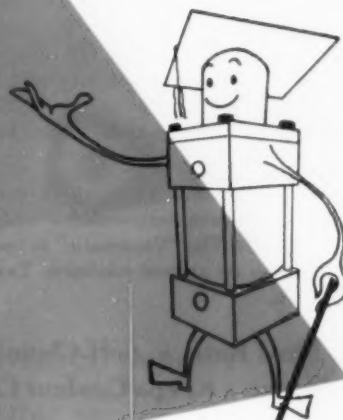
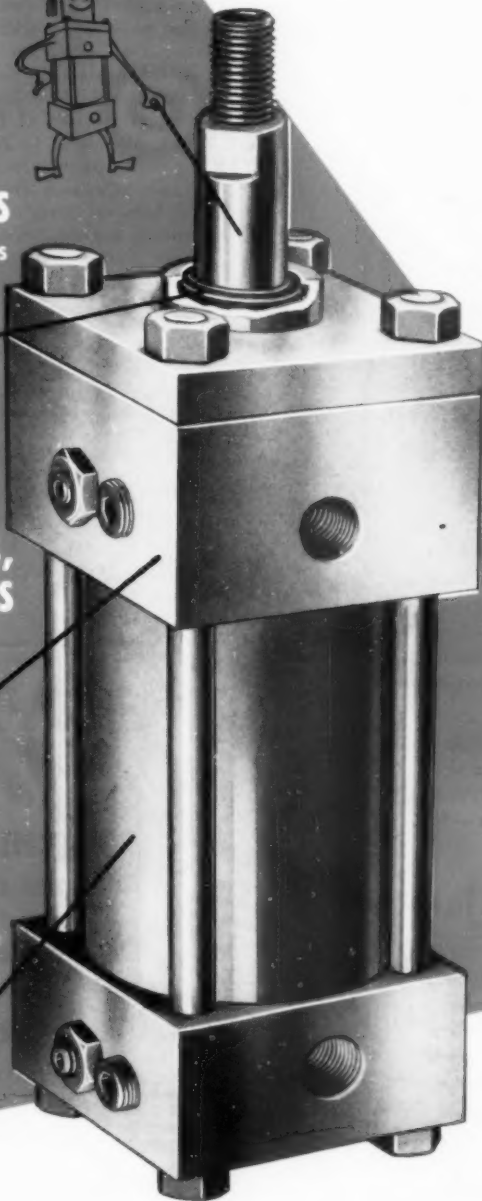
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Eliminate Breakage



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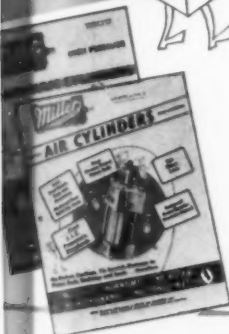


**MET J. I. C. PNEUMATIC STANDARDS** years before their adoption in 1950.

**SPACE-SAVING SQUARE DESIGN** originated by Miller in 1945.

WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.



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in industry's most complete  
line of filtration equipment

**HOFFMAN**

*Vacu-matic*

**FILTER**

for automatic,  
continuous  
filtering of  
water soluble  
coolant from



Write for  
Bulletin A-915

grinders, hones and other machine tools

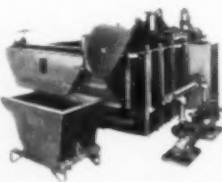
Once again Hoffman meets your particular filtration problem with equipment specifically designed for the job! The "Vacu-matic," a continuous suction, endless belt filter, serves individual machines with clean coolant *automatically*. Uses vacuum (not gravity) for high flow rates—coolant is drawn through belt which deposits solid particles as dry sludge in tote box for easy removal.

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**High Flow Rate • Self-Cleaning  
Dry Sludge • Keeps Coolant Cool**

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Fully Automatic**  
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## 21st ANNUAL MEETING AMERICAN SOCIETY OF TOOL ENGINEERS

**Program to Stress Productivity  
and Cost Reduction**

Increased productivity and cost reduction, two vital factors in the economic success of America's industrial production program for many years to come, will be emphasized in the 22-paper technical program at the 21st Annual Meeting of the 24,000-member American Society of Tool Engineers to be held in Detroit, March 18 to 20.

Many of the eight papers in the program which cover production processes stress highly productive types such as contour forming, spinning, drawing and high speed boring. Six papers deal with product design considerations, two with metallurgical subjects and five with cost reduction concepts.

To round out a comprehensive program there will be 13 tours of various industrial plants in the Detroit area.

Plan today to attend this **OUTSTANDING ANNUAL MEETING**.

For further information contact:

Richard J. Bacik, Secretary  
ASTE National Program Committee  
American Society of Tool Engineers  
10700 Puritan Ave., Detroit 21, Michigan

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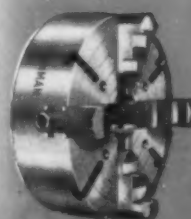
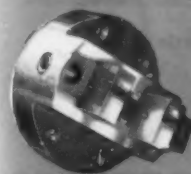
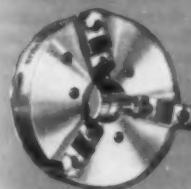
**RAHN GRANITE SURFACE PLATE CO.**  
635 N. Western Av. Dayton 7, Ohio

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# CUSHMAN

PROUDLY ANNOUNCES AN IMPORTANT ADDITION  
TO AMERICA'S LARGEST PRECISION CHUCK  
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These "Vital Statistics" mean . . . increased  
production . . . better service for our customers  
. . . better preparedness to meet defense needs.

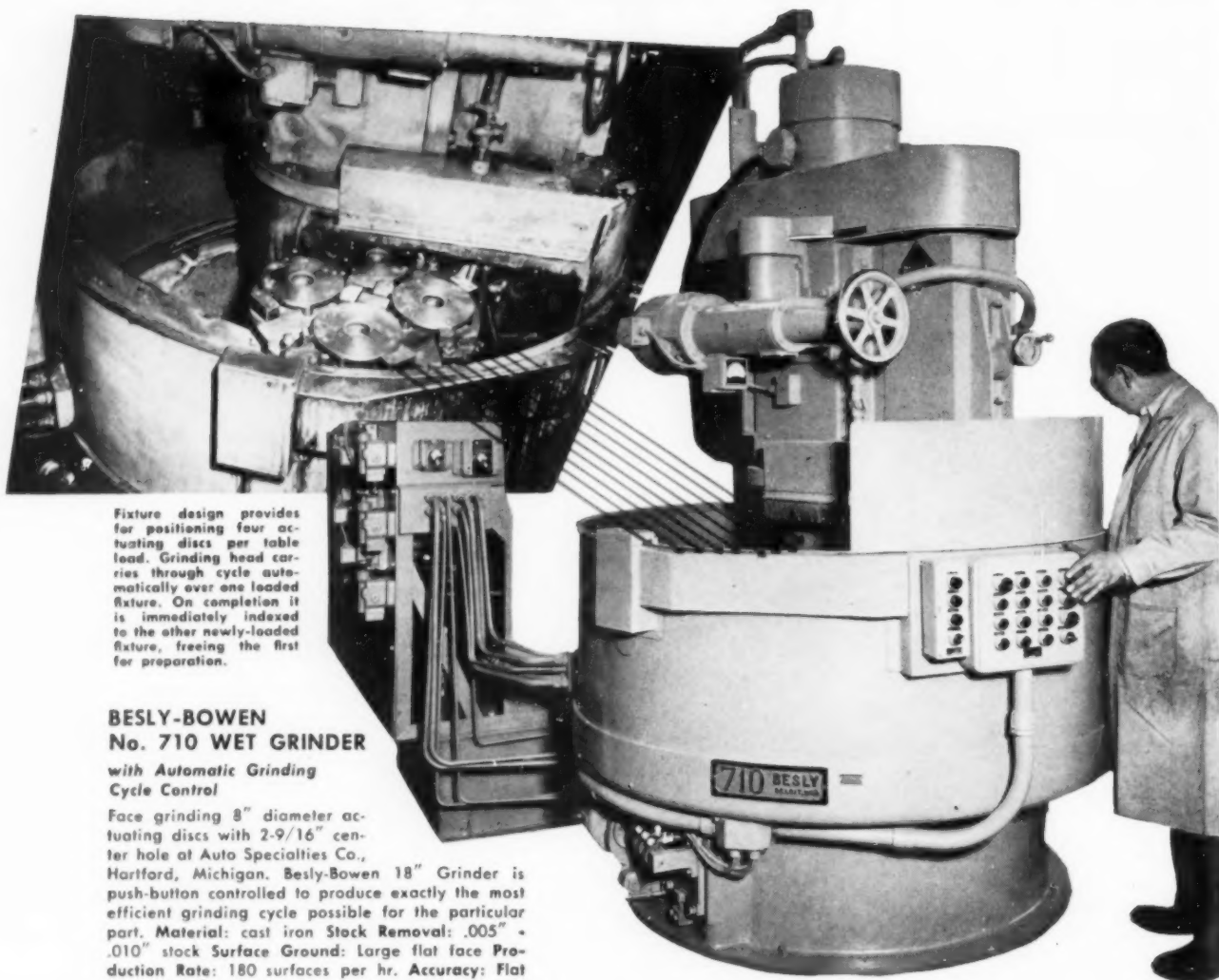
Additional shop floor area increases the potential  
over-all output approximately 40%.

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817 WINDSOR STREET  
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Chucking Engineers Since 1862

*Manufacturers of*

POWER CHUCKS, AIR CYLINDERS, and  
ACCESSORY EQUIPMENT • THE CUSHMAN  
POWER WRENCH • CUSHMAN MANUALLY  
OPERATED CHUCKS and FACE PLATE JAWS

**A WORLD STANDARD FOR PRECISION**



Fixture design provides for positioning four actuating discs per table load. Grinding head carries through cycle automatically over one loaded fixture. On completion it is immediately indexed to the other newly-loaded fixture, freeing the first for preparation.

**BESLY-BOWEN  
No. 710 WET GRINDER**  
with Automatic Grinding  
Cycle Control

Face grinding 8" diameter actuating discs with 2-9/16" center hole at Auto Specialties Co., Hartford, Michigan. Besly-Bowen 18" Grinder is push-button controlled to produce exactly the most efficient grinding cycle possible for the particular part. Material: cast iron Stock Removal: .005" - .010" stock Surface Ground: Large flat face Production Rate: 180 surfaces per hr. Accuracy: Flat within .004", surface finish 25-30 micro-inch R.M.S.

# No IDLE Machine Time

**BESLY-BOWEN  
GRINDERS**

are Multi-Purpose Face Grinders and include models 3 horse power to 30 horse power, all available with Automatic Cycle Control.

Many plants have accepted as unavoidable a grinding operation in which the operator merely stands by to supervise the grinding cycle, then busies himself while the machine is idle. Besly-Bowen Grinders bring to this situation a striking shrinkage in costs by using two rotary work tables: Over one the machine grinds automatically under control by the automatic cycling mechanism, while the operator works at the other unloading, cleaning, reloading. Result: continuous operation . . . no idle machine time . . . reasonable period for cleaning the fixture before re-loading thus reducing rework and scrap . . . non-intermittent working conditions and

thus less pressure on the man.

This is only part of the success story on Besly-Bowen Grinders which also offer improved performance at these points: Positioning the work to the wheel is more accurate — Ample coolant directed to do the most good — Correct feed rate for most efficient stock removal. Whatever your grinding demands you should talk to the Besly representative in your territory, since the Besly Line covers all situations. But ask him specifically about the Besly-Bowen Radial Head Face Grinders. Meanwhile send the coupon below for advance literature to consider.

**BESLY-WELLES CORPORATION • Beloit, Wisconsin**

Established as Charles H. Besly & Company in 1875

**BESLY**

BESLY Grinders, all types and sizes

Taps, Drills and Reamers by BESLY

**BESLY**

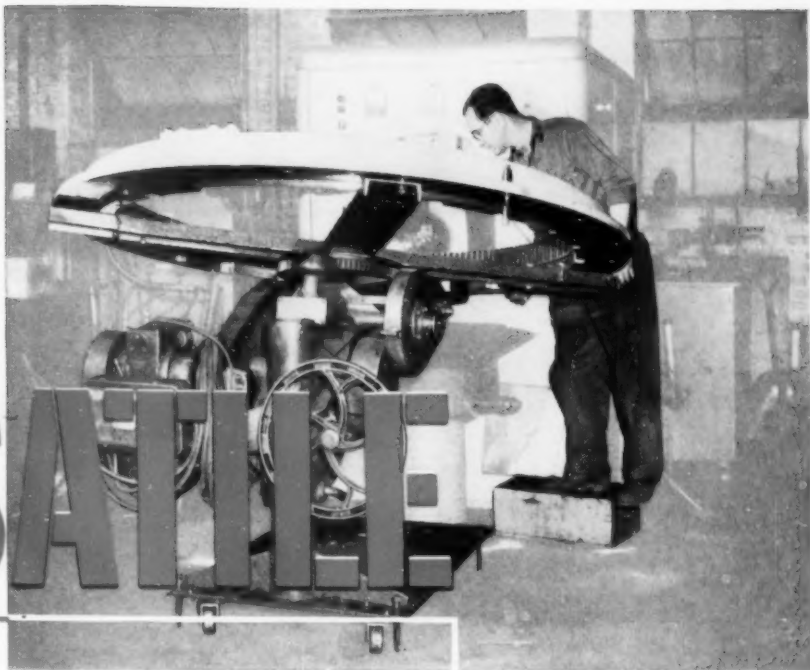
BESLY-TITAN Abrasive Wheels & Discs

Send This  
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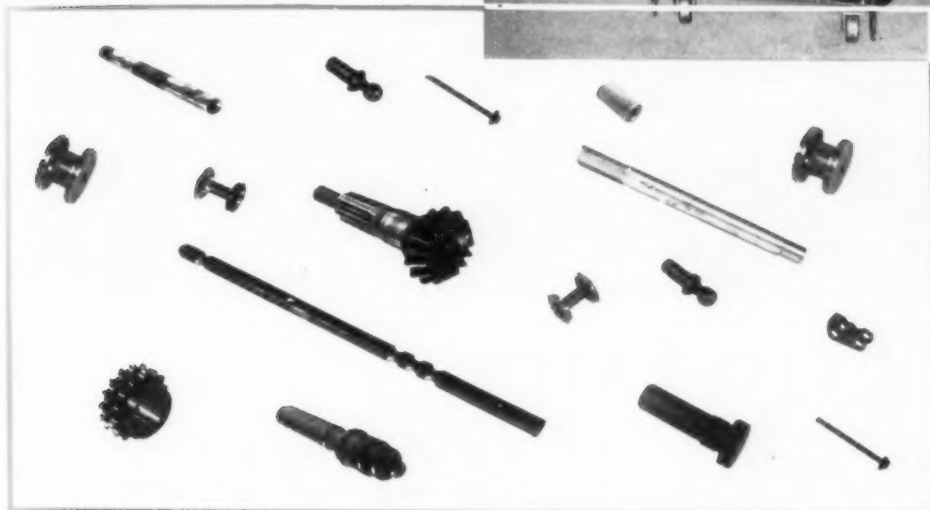
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BELOIT, WISCONSIN  
Please send us Besly Disc  
Grinder Booklet with detailed  
story of Besly-Bowen machines.  
Also (check here) have a representative call.

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COMPANY \_\_\_\_\_ POSITION \_\_\_\_\_  
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CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

# VERSATILE



"Internal ring gear being hardened on the Lindberg LI-25 Induction Heating Unit".



Investigate the amazing versatility of the Lindberg Induction Heating Unit—approximately 2000 different parts have been selectively hardened or annealed on this typical commercial heat treating installation.

**FROM THE LARGEST**—The internal ring gear illustrated above—with a 60" inside diameter,  $3\frac{1}{2}$ " face with 187 teeth each individually heated and oil spray quenched.

**TO THE SMALLEST**—This small 2" stamped metal rocker arm was selectively heated and water quenched on the small square face at the rate of 3000 per hour. Investigate this versatile Lindberg Induction Heating Unit—it may supply the answer to your selective heating operations.



## SPECIFY LINDBERG

for any heat treating or melting need! Lindberg manufactures every type and many sizes of melting and heat treating furnaces from tiny laboratory units to mammoth field erected installations—whether it's gas, oil, electric, arc, low or high frequency—consult your local Lindberg Office!

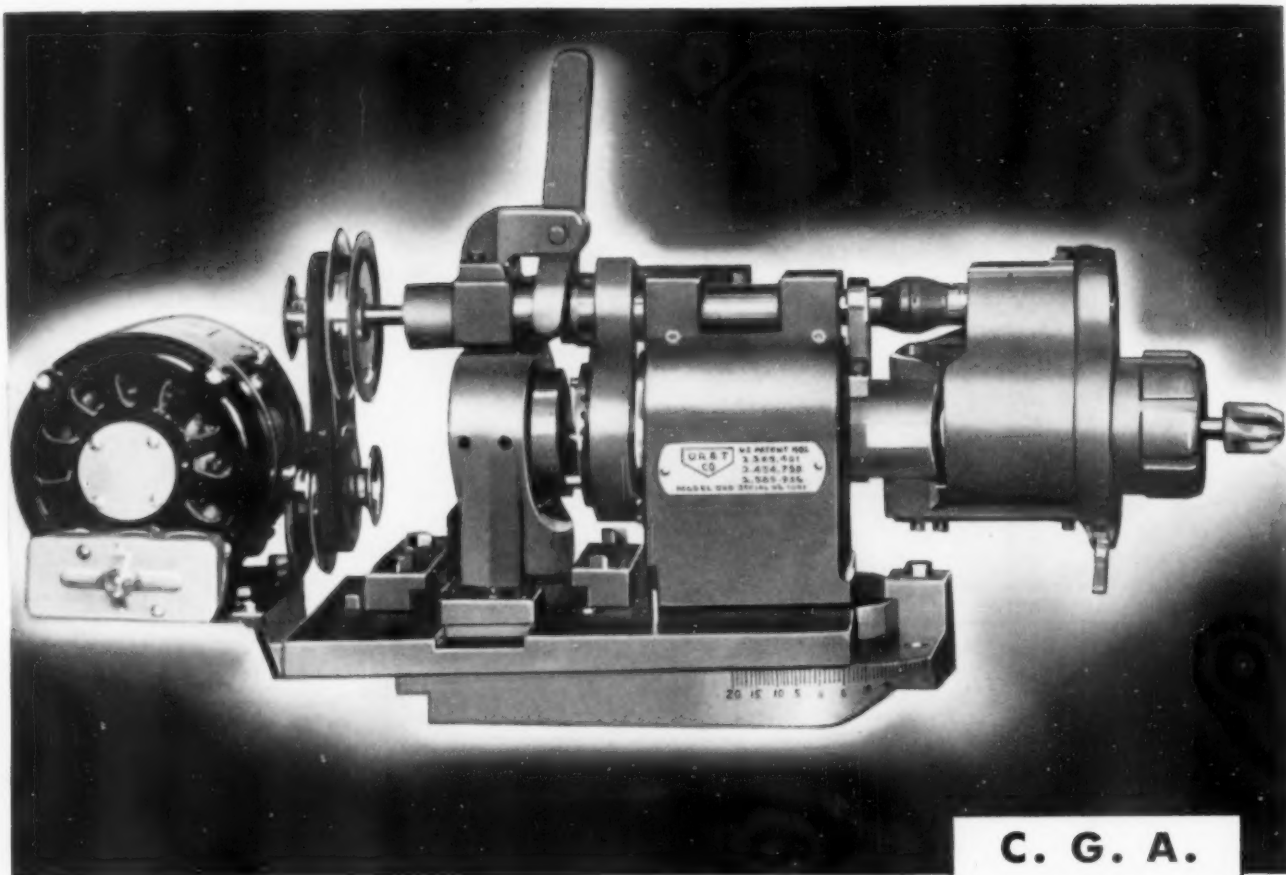


# LINDBERG

## HIGH FREQUENCY DIVISION

LINDBERG ENGINEERING COMPANY 2447 W. Hubbard Street, Chicago 12, Illinois





**C. G. A.  
MODEL 500**

## ***New* CIRCULARITY. . . . GRINDING ATTACHMENT**

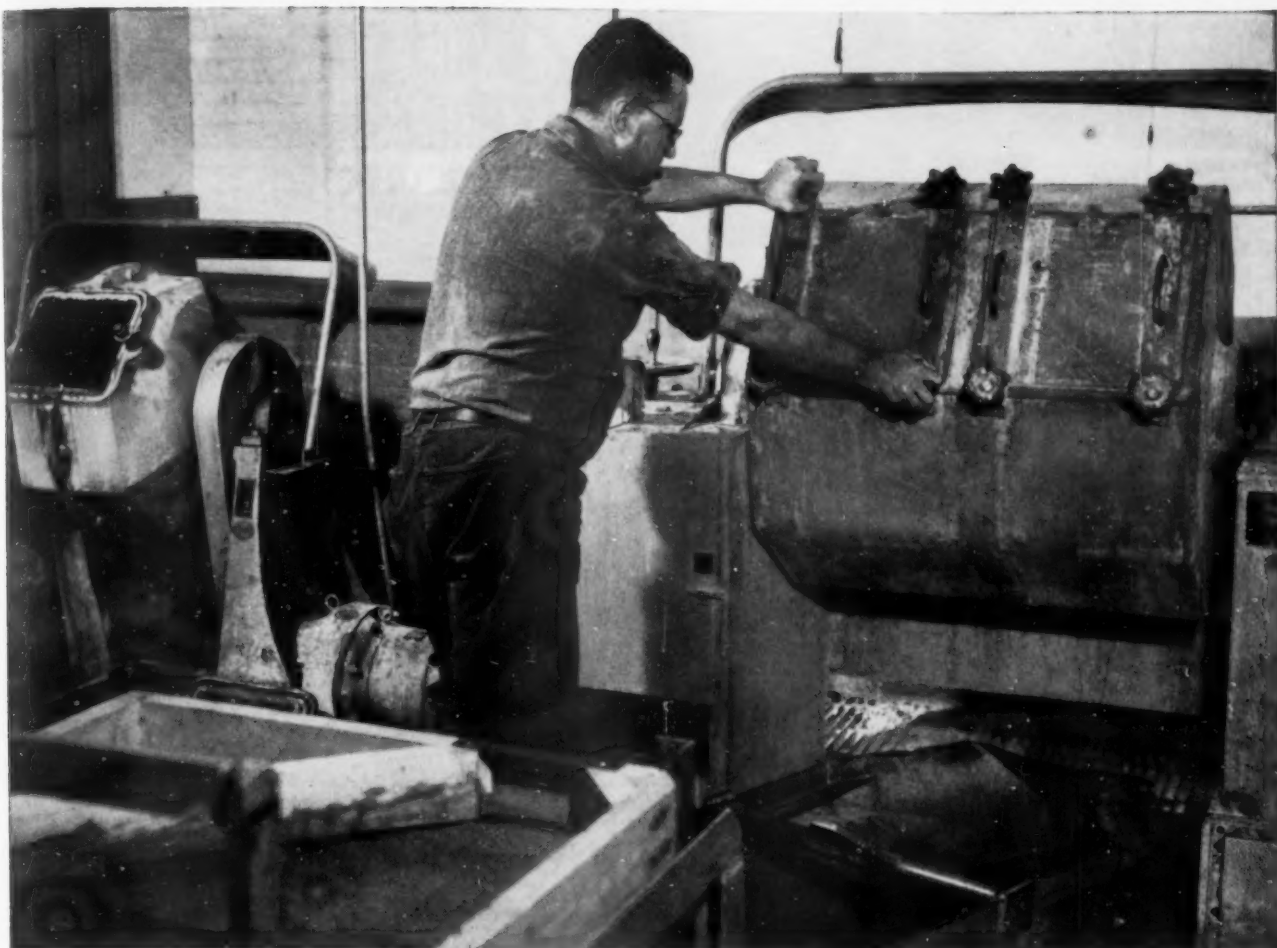
Detroit Reamer & Tool Company engineers, after months of intensive research and extensive development, have produced in the model 500 Circularity Grinding Attachment a new device that has many outstanding improvements. This new model is faster, easier to handle, has positive control, greater adaptability, rugged construction, and is engineered and precision built to provide the finest in precision work. Therefore, it will be of invaluable assistance to anyone whose tooling standards must meet modern production requirements.

Simple, speedy set-ups on this accurate attachment permit fast and easy grinding of form relief, radial relief, form and radial relief together, tapered cylindrical and straight cylindrical. Cutting tool to be produced or reworked is held in collet or between dead centers and revolves on its own axial center. Where full length of spiral cutting tools is to be ground for both form and radial relief, the Circularity Grinding Attachment travel is similar to an O.D. grinder, which insures fine finish, back taper and accurate size.

# **DETROIT REAMER & TOOL CO.**

**2830 E. SEVEN MILE ROAD • DETROIT 34, MICH.**





One of a number of different Tumbling barrels in which sample parts are processed in the new Norton barrel-finishing department.

## New Norton sample processing department helps manufacturers speed up production

Plan now to take advantage of this new enlarged service department.

If you'd like to find faster methods for deburring and forming uniform radii on vitally needed parts — or if you have special problems in finishing parts ranging from tiny needles to castings and forgings weighing several pounds — send us samples of your parts. Tumbling is very likely the answer to your problem. And the new Norton sample processing department is the ideal set-up for finding just exactly what you can accomplish through barrel-finishing. Many manufacturers have already realized substantial savings and speed-ups in production through this service.

This new Norton department has a variety of Tumbling barrels of different types and capacities plus auxiliary equipment such as a mechanically vibrated screen. Here, Norton production engineers determine for you —

without charge or obligation — just exactly what tumbling can do for the metal parts you send. Detailed recommendations are then given so that you can know exactly how to get the best results for your particular problem. These recommendations include barrel type, size and speed, size and amount of ALUNDUM\* Tumbling Abrasives to be used, amount of water, type and amount of compound or cleaner, time cycles and other data.

### Send Samples Now

For sample processing, we need: representative sample parts plus (a) the finished sample to be matched (hand-finished, if necessary) and (b) information on your present barrel-finishing equipment, if any, including type and size of barrel and barrel speeds. These should be sent to Norton Company, Worcester 6, Massachusetts, attention of Sales Engineering Department, Abrasive Division.

About a week is required for processing the samples after they have been received.

Meanwhile, for further information get the 55-page Norton handbook on barrel-finishing. Ask your Norton Distributor for Form 501 or write us direct.

\*Trade-Mark Reg. U. S. Pat. Off.

**NORTON COMPANY, Worcester 6, Mass.**  
Distributors In All Principal Cities  
Export: Norton Behr-Manning Overseas  
Incorporated, Worcester 6, Mass.

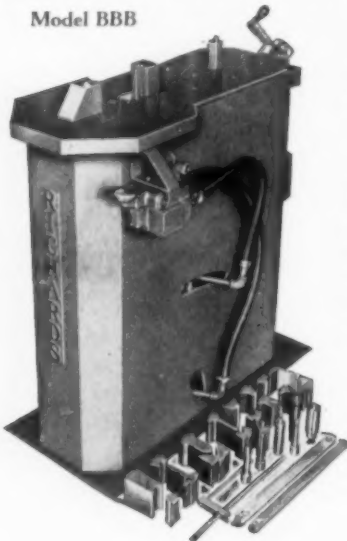


*Making better products to make  
other products better*

## MULTIFORM BIG BROTHER BENDER

**Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses**

Model BBB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

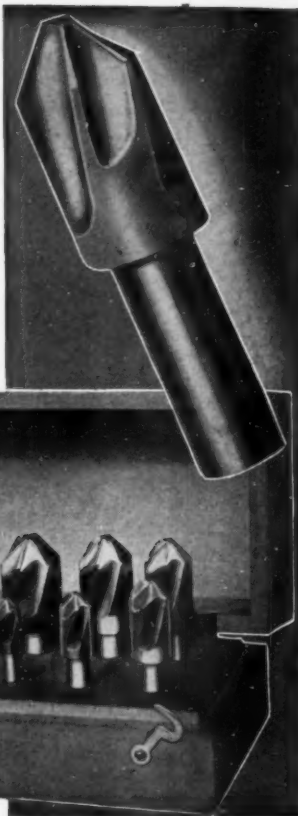
The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to  $\frac{1}{4}$ " thick by 4" wide. We also build smaller hand or air operated models for forming up to  $\frac{1}{8}$ " x  $1\frac{1}{2}$ " material.

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## CUT COSTS... FASTEN "ON THE DOUBLE"

with the

*Chicago*  
"214" DOUBLE  
RIVET SETTER



The "214" automatically feeds, inserts and clinches two rivets at a time... with speed that may mean a big saving in your fastening costs. 14" throat makes large assemblies easy to handle. For up to 9/64" diameter steel rivets—lengths to  $\frac{7}{8}$ ". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to its versatility. Ask us how the "214" can help you cut costs. Send a sample of problem assembly (or blue print) for Free fastening analysis.

**FREE CATALOG**

contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.

**Chicago Rivet & MACHINE CO.**

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**directly on any size job!**

Accuracy guaranteed by individual calibration of each instrument. Direct dial readings—no conversion charts or calculations. Available in Rockwell "A", "B", "C", "15N" and Brinell Scales. Tests any size, shape, type metal, on-the-job!

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OR DEMONSTRATION

**portable metal hardness testers**

Manufactured in the United States

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IN CANADA: NEWAGE (CANADA) LIMITED, 1174 BAY STREET, TORONTO, ONTARIO

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## **ILLINITE<sup>®</sup>** **STANDARD CUTTING TOOLS**

### **A COMPLETE LINE**

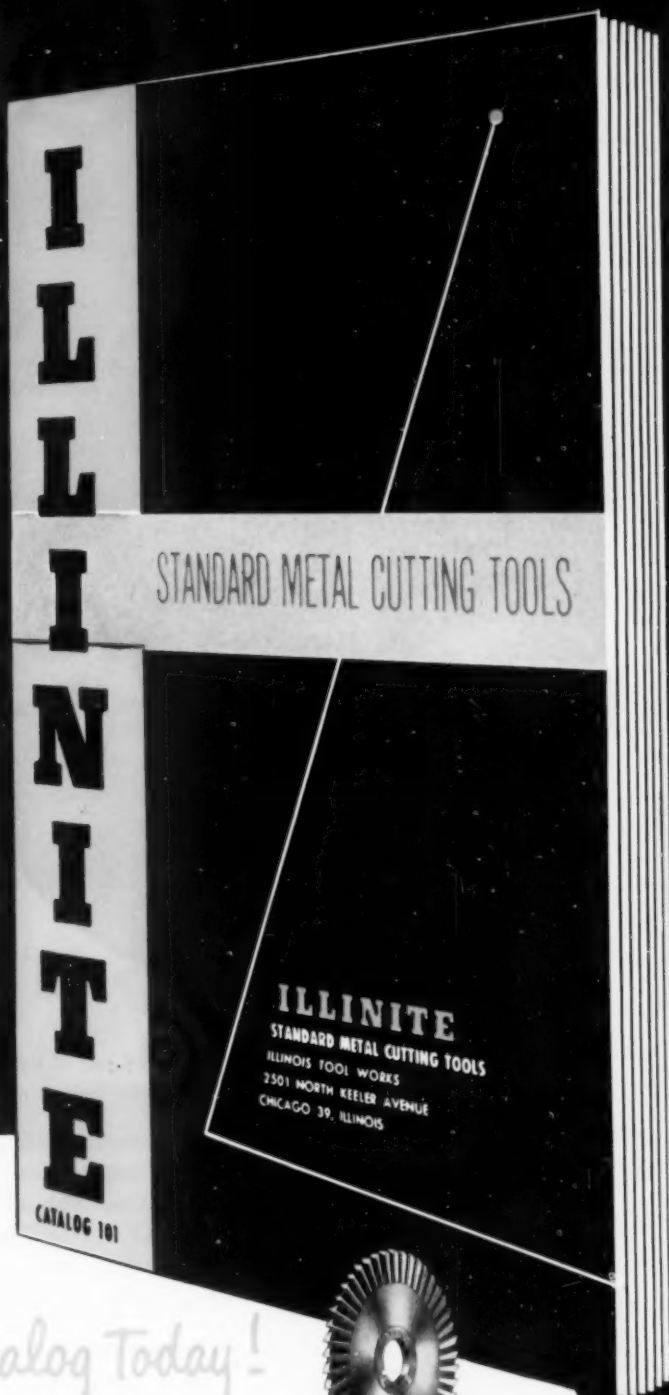
End mills, saws, milling cutters, hobs, shaper cutters and tool bits—all in accordance with latest applicable A.S.A. standards

### **ENGINEERED FOR PRODUCTION EFFICIENCY**

Design features, precision workmanship and top quality materials assure faster cutting, longer life.

### **AVAILABLE THROUGH LEADING DISTRIBUTORS**

A nationwide system of stocked distributors assures convenient service, prompt delivery



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## **ILLINOIS**

### **TOOL WORKS**

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*Look,  
fellas,  
Two  
hands!*

YES, YOU CAN USE BOTH HANDS WHEN YOU RUN A CARLTON RADIAL DRILL . . . THAT'S THE NATURAL, EFFICIENT PROFITABLE WAY . . . WITH CONTROLS ARRANGED IN LOGICAL, CONVENIENT ORDER ON BOTH SIDES OF THE HEAD . . . CARLTON RADIAL DRILL OPERATORS ACTUALLY DEVELOP "TOUCH SYSTEMS" THAT SAVE TIME AND EFFORT.



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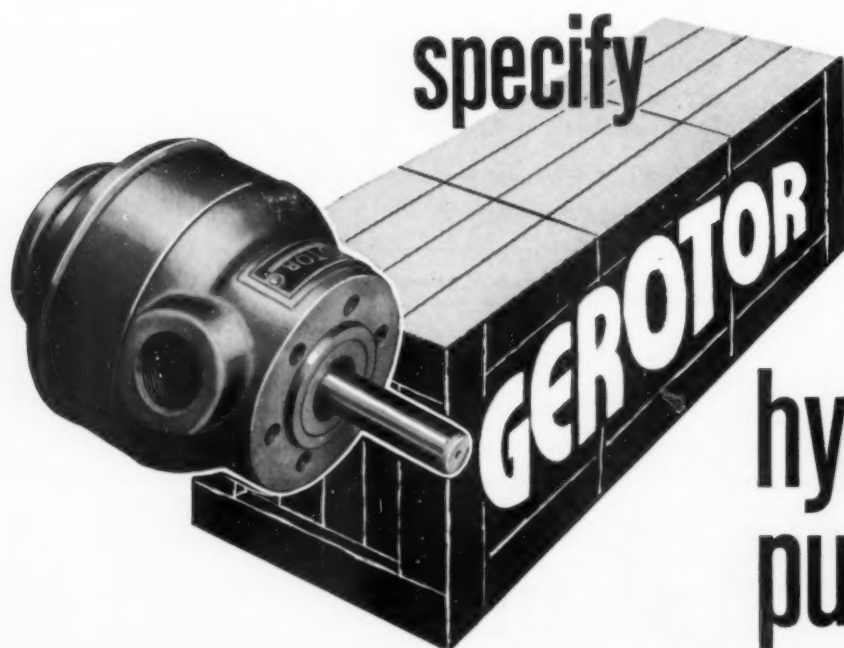
# What are your *requirements* FOR hydraulic pumps?



If you need **PROMPT** delivery to expedite production...



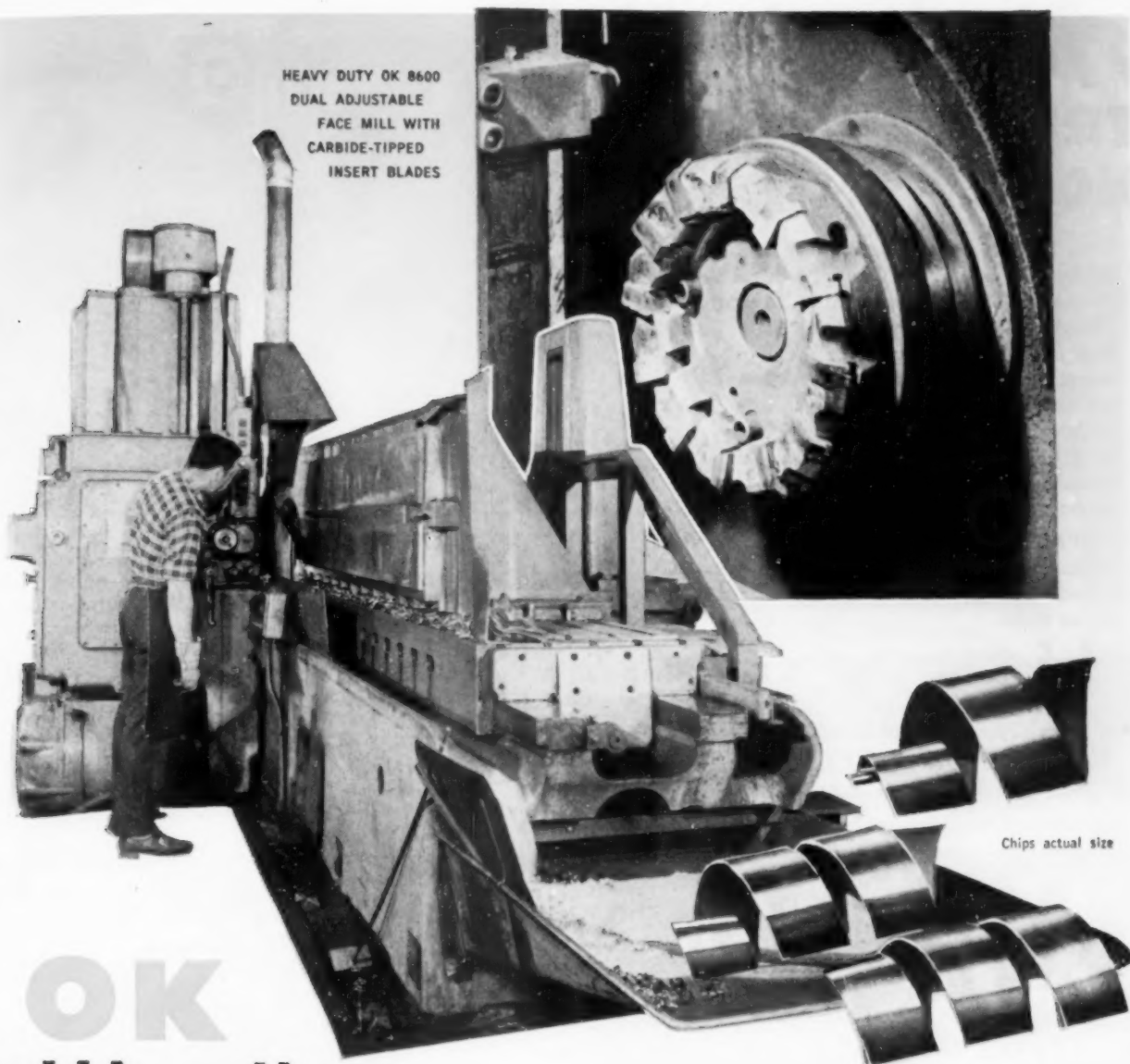
If you need **PUMP** delivery from .4 to 40 gallons per minute . . . at operating pressures up to 1000 p.s.i. (in some sizes, 1200 p.s.i. continuous, 1500 p.s.i. intermittent) . . . with the smoother, more uniform flow produced by the highly efficient Gerotor mechanism . . .



## hydraulic pumps

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CORPORATION,  
BALTIMORE 3,  
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HEAVY DUTY OK 8600  
DUAL ADJUSTABLE  
FACE MILL WITH  
CARBIDE-TIPPED  
INSERT BLADES



## OK carbide cutters

**make short work of taper-milling chrome-moly prop blades  
for B-36 Bombers at Curtiss-Wright Caldwell plant**

Here is a good example of how progressive management speeds up heavy milling operations with carbide cutters. The machine is a high powered planer-type miller with mechanical feed and magnetic chuck. The cutter is a heavy duty OK 8600 dual adjustable carbide face mill. Work pieces are tough chrome-molybdenum steel 25" x 123" x .800" for C-W hollow propeller blades for famous B-36 Intercontinental Bombers. Each plate is taper milled for a distance of 107 inches, above and below center rib, the depth of cut increasing from zero to .390 inches. The lower half is milled on the forward stroke and the upper half is milled on the reverse stroke, at the rate of 23 inches per minute. A movie of this operation dramatically shows

chips piling on the magnetic chuck and presto! . . . they drop when chuck is demagnetized.

OK carbide milling cutters are built for solid performances like this. They have the strength of simple construction — two-piece body and wedge-shape blades. Mating serrations insure blade security and provide for blade advancement to compensate for wear. No locks, wedges or screws weaken or mar the streamline design. With more beef in the body, OK cutters can better stand the terrific pressures of modern high speed milling.

If you have a milling problem, you should have OK catalog 13. An OK engineer will be glad to give the benefit of our experience over the past 50 years.



**OK**

## modern milling cutters for modern milling machines

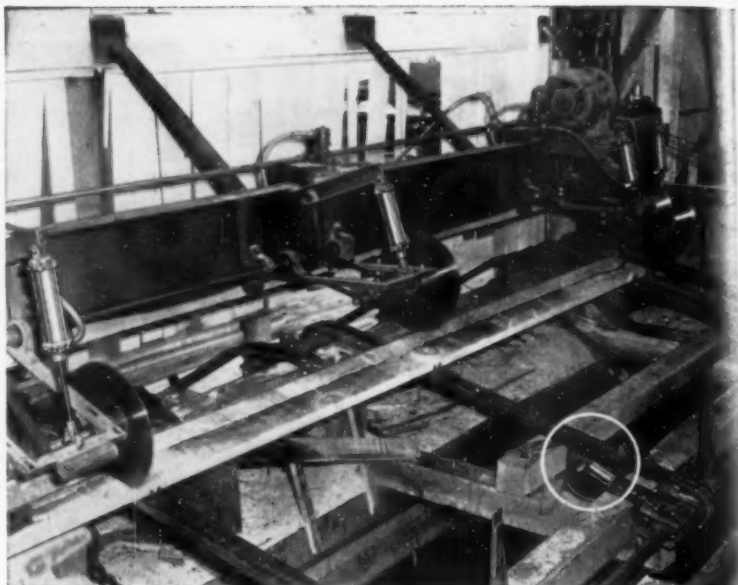
THE OK TOOL COMPANY, Milford, New Hampshire

# Air Feed for TRIM SAWS..with NOPAK Air Cylinders

This 8-saw trimmer installation at Lumber Mills Corp., Ashland, Ore., utilizes NOPAK Model "E" cushioned Air Cylinders to "feed" the saws to the work. As the Link-Belt conveyor chains carry the lumber toward the trim saws, only the two saws which cut the boards to commercial lengths with minimum waste are lowered by the NOPAK Cylinders. The cylinders may be actuated by manually operated or automatic valves.

NOPAK Cylinder, located under conveyor chain, powers flipper arms which transfer boards from preceding conveyor chains at lower right.

**NOPAK**  
VALVES AND CYLINDERS  
DESIGNED for AIR and HYDRAULIC SERVICE  
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-2-214-1



Photograph, courtesy of Link-Belt Co., shows NOPAK Model "E" Cylinders used in conjunction with Link-Belt conveyor chains and pillow blocks.

This is one of many lumber mill installations employing NOPAK Cylinders to move saws into cutting position. (Others are shown in the NOPAK Application Manual.) It may suggest similar uses for NOPAK Cylinders and NOPAK Valves in your plant, or in machinery you build for resale.

For Data and Dimensions refer to Sweet's File for Product Designers, or write for Bulletin SW-1.

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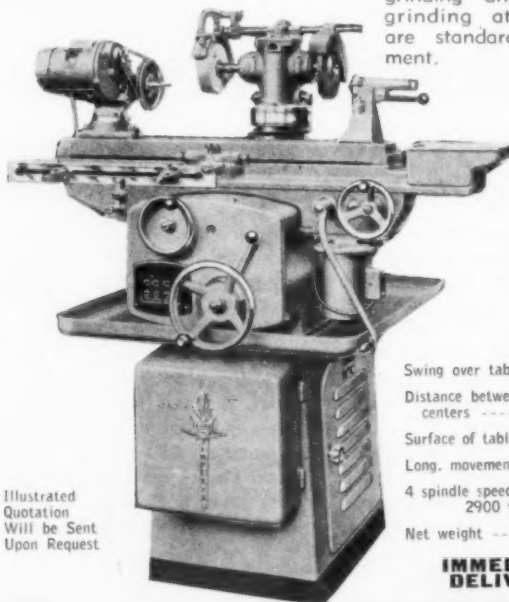
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BERKLEY, MICH. LINCOLN 2-5600

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## #2 IMPERIA UNIVERSAL TOOL & CUTTER GRINDER

Equipped with 4 A.C. motors and arranged for external and internal grinding with automatic table movement. Accommodates No. 50 Nat. Std. and B. & S. #12 taper shanks.

Coolant system for wet grinding and radius grinding attachment are standard equipment.



Illustrated Quotation Will be Sent Upon Request

Swing over table ----- 10"  
Distance between centers ----- 20"  
Surface of table -- 5"x32"  
Long. movement ---- 13 3/4"  
4 spindle speeds  
2900 to 5800 RPM  
Net weight ----- 1,050 lbs.

**IMMEDIATE DELIVERY**

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TEL. TRiangle 5-2103 & 2157

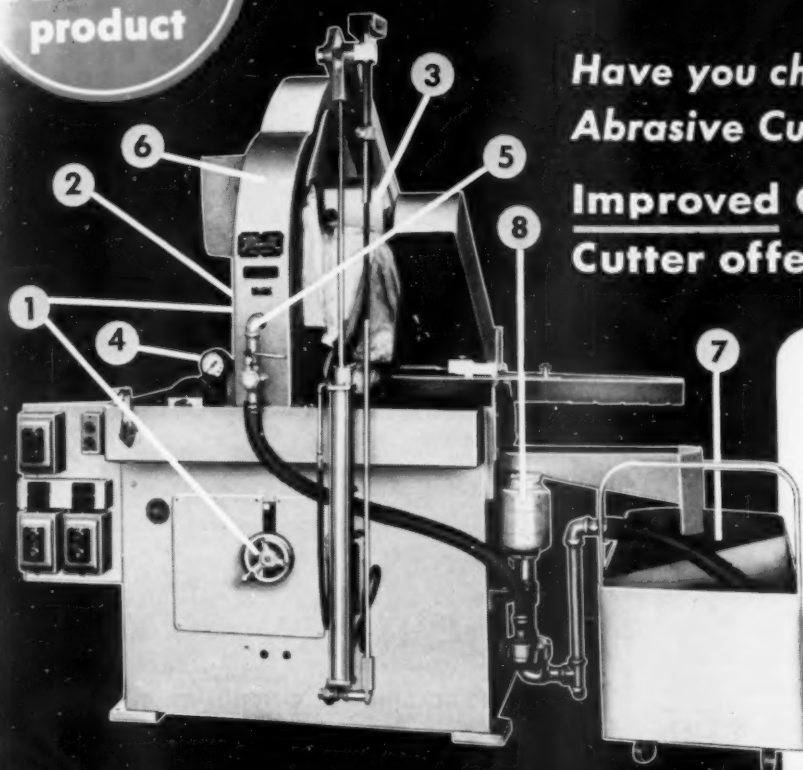
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The Tool Engineer



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product

## CAMPBELL ABRASIVE CUTTERS



Have you checked on  
Abrasive Cutting lately?

**Improved Campbell No. 406  
Cutter offers these features:**

- 1 BRIDGE TYPE WORK CLAMP**  
on both sides of cutting wheel, quickly  
and easily adjusted
- 2 WHEEL GUIDES** for more  
accurate cuts . . . reduces wheel flutter
- 3 CUTTING WHEEL OSCILLATION**  
for quality cutting over 2" diameter solids
- 4 LOW PRESSURE SELF-  
CONTAINED HYDRAULIC SYSTEM**  
for operating controls
- 5 EASILY ADJUSTED,  
SIMPLIFIED, RUGGED COOLANT  
DISTRIBUTOR** to insure adequate supply  
of coolant on both sides of cutting wheel
- 6 COMPLETELY ENCLOSED  
CUTTING WHEEL** for operator's safety
- 7 SEPARATE COOLANT TANK**  
. . . large capacity . . . may be easily  
removed for cleaning
- 8 EXTRA-LARGE CAPACITY  
COOLANT PUMP**

*—plus  
many other  
valuable features!*

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### Save You Money

• Even old model abrasive cutters made big savings by reducing the cut-off time per piece, but the new improved CAMPBELL Abrasive Cutters—with their many new time and effort reducing features—show still greater efficiency and savings. CAMPBELLS pay for themselves out of savings.

Check the methods and equipment you use. On many jobs cutting time can be reduced up to 75%. Machines can be furnished in fully automatic or semi-automatic types.

Write today for Bulletin DH-260 which tells you how to modernize your cutting procedure with a CAMPBELL 406. Then give us details of the job to be done so we can make recommendations and quote prices.

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AMERICAN CHAIN & CABLE

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**CAMPBELL**  
Abrasive Cutters  
and  
Nibblers



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3. Saves space in tool crib.
4. Indispensable for toolroom work in addition to production.

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## RUTHMAN GUSHER COOLANT PUMPS

Your Gusher gives you—

- ① **ECONOMY**—Uses less power when throttled—requires less attention—
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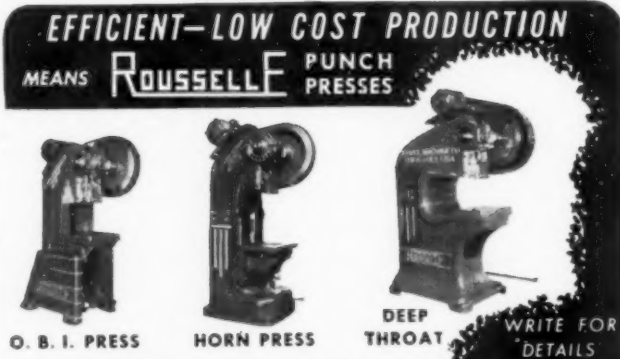
For a better coolant pump specify Gusher Pumps on your metal cutting machine.

This Superior Honing Machine is equipped with a Ruthman Gusher Pump—Follow the leader; specify Ruthman on your machine.



**THE RUTHMAN MACHINERY CO.**

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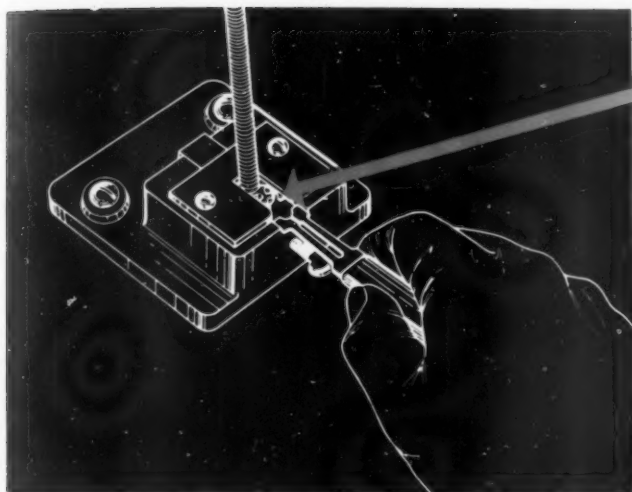


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# New Waldes Truarc E-Ring Dispenser\* Speeds Assembly, Cuts Time and Costs



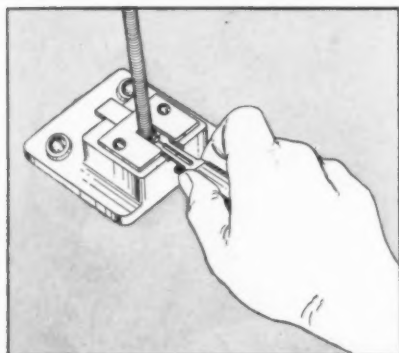
U. S. PAT. PENDING

**FOR GREATER TIME-SAVING**, more efficient handling and assembly of Waldes Truarc E-rings,\* here is an automatic, precision tool. Designed for one-at-a-time repeating action, the Truarc E-ring Dispenser can be easily operated by any assembly worker.

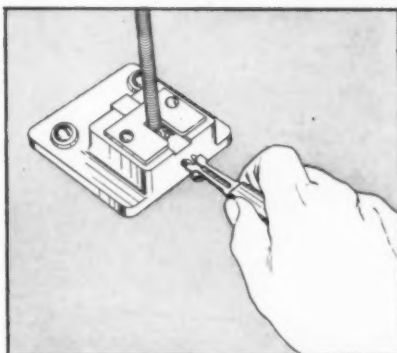
**WALDES TRUARC E-RINGS** (sizes 5133-9 to 50 inclusive) are now available packed on stackrods in quantities ranging from 250 to 500 pieces per rod. Stackrods are precision-made, allow re-loading in seconds. No interruptions to continuous flow in assembly.

\*Dispensers for Waldes Truarc Crescent Rings (series 5103) also available.

## SIMPLE 1, 2, 3 ASSEMBLY OPERATION



**1** Truarc applicator is pushed forward and grips a single E-ring.



**2** Applicator withdrawn (new ring automatically feeds into place).



**3** Ring is installed in groove on shaft. No waste time or motion.



WRITE, TODAY, FOR COMPLETE BROCHURE  
ON WALDES TRUARC E-RING DISPENSER

# WALDES TRUARC

REG. U. S. PAT. OFF.

## RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING  
U. S. PATENTS: 2,382,947; 2,382,948; 2,416,952; 2,420,921; 2,420,941; 2,439,785; 2,441,846; 2,455,165;  
2,483,380; 2,483,385; 2,487,902; 2,487,903; 2,491,306; 2,509,061 AND OTHER PATENTS PENDING.



**Waldes Kohinoor, Inc.**

47-16 Austel Place, L. I. C. 1, N. Y.

TE025

☐ Please send me the new Waldes Truarc E-ring Dispenser brochure.

☐ I am also interested in dispensers for Crescent Rings.

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TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

BUSINESS ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



# If Parts Like These are Production Headaches..



*then make **SIMONDS Special Parts Division** part of your own production line!*

Heat Treated Discs — all types

Valve Discs (Compressors)

Clutch Discs (Multiple Disc Type)

Aircraft Engine Discs

Machine Parts (Flat Steel)

Wear Plates (Ways, etc.)

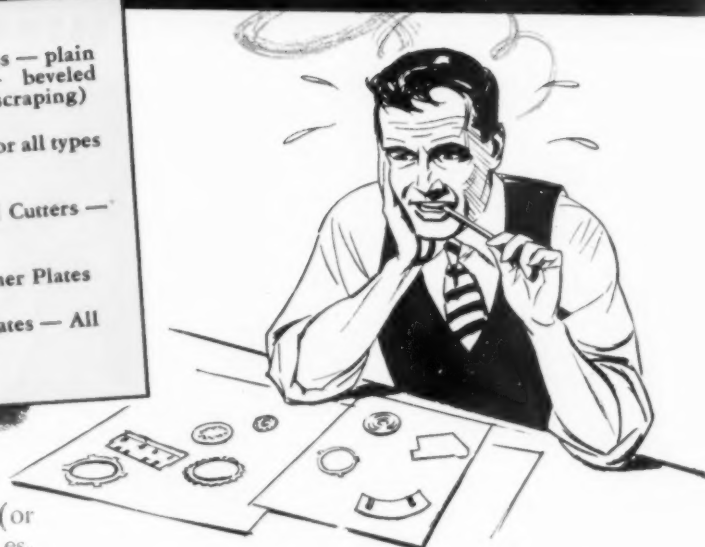
Blades — All types — plain — toothed — beveled (For cutting or scraping)

Circular Cutters for all types of cutting

Irregular Shaped Cutters — All types

Heat Treated Liner Plates

Rectangular Plates — All types



If you're having difficulty manufacturing (or obtaining) any **FLAT STEEL PARTS** . . . especially parts that require heat treating and grinding . . . then here's your headache powder.

Simonds Special Parts Division can be your production line for these parts . . . raw steel from Simonds Steel Mill in Lockport, N. Y., fabricated into your part at Simonds Famous Windowless Plant in Fitchburg, Mass.

Simonds Special Parts Division is fully equipped to produce precision parts for aircraft engines, printing presses, slitting machines, air compressors and numerous other applications. Clutch discs for coal handling equipment, machine tools, marine transmissions, etc., is

another Special Parts Division item. Send your inquiries, with full specifications or blueprints, direct to Simonds Special Parts Division, Fitchburg, Massachusetts.

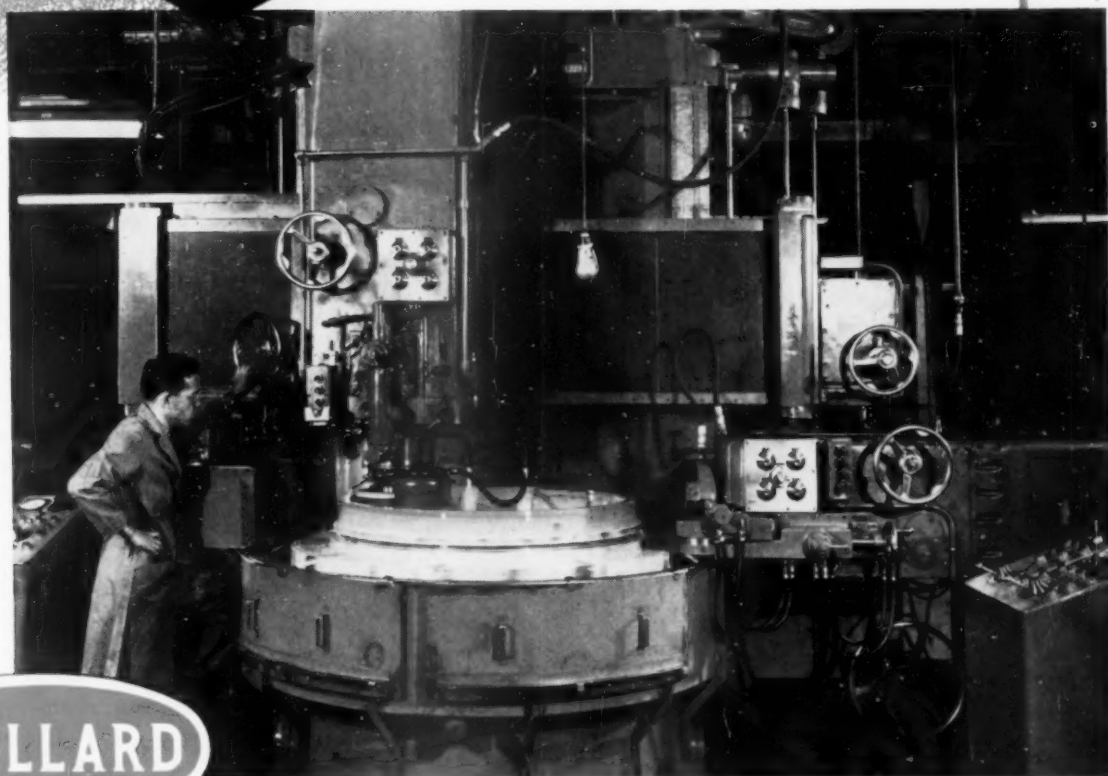


Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon.  
Canadian Factory in Montreal, Que.

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*Grinders*  
**BY BULLARD**



**BULLARD**

Bullard presents a carefully engineered and developed Vertical Chucking Grinding Machine in a range of sizes to meet present day requirements for conveniently grinding the larger sizes of work.

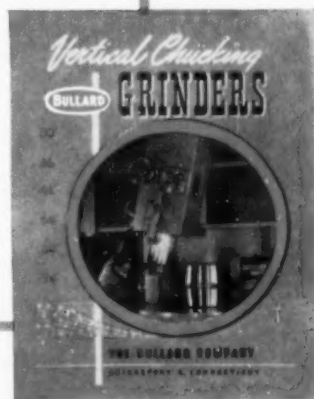
Years of study of field requirements for a truly accurate machine of this kind have produced this Vertical Chucking Grinding Machine now in production at the plant of TIMKEN BEARING CO. Canton, Ohio.

It is designed and built with Bullard characteristic Vertical Turret Lathe ruggedness and rigidity, combined with the sensitivity of control and built in precision so essential for successful grinding results.

Precision, flexibility of control, safety design and productive efficiency place **THIS LINE OF VERTICAL CHUCKING GRINDING MACHINES** as an **IMPORTANT** item on your list for immediate investigation.

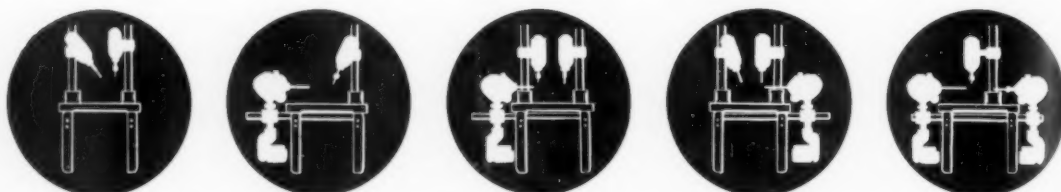
*Write now for Delivery dates and complete information, ask for VG-6S.*

**THE BULLARD COMPANY**  
BRIDGEPORT 2, CONNECTICUT



# MAGNA DRILL

the completely universal drilling machine



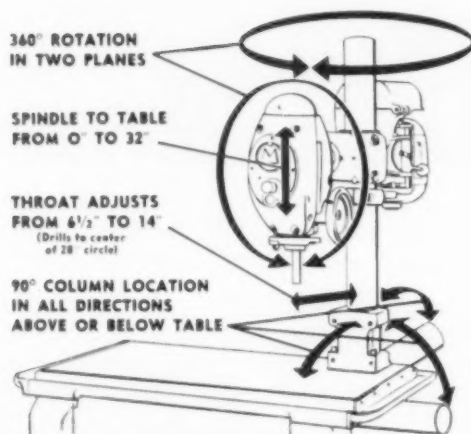
If you're still drilling holes one at a time, there are important new production economies waiting for you in MAGNA DRILL, the completely universal drilling machine. MAGNA DRILL increases speed and accuracy, cuts tool and labor costs . . . in both large and small shops, in both limited and mass production.

Key to these benefits lies in MAGNA DRILL's complete versatility. Any number of heads can be set up quickly and accurately for simultaneous multiple drilling . . . each with its own speed, feed and drilling angle. MAGNA DRILL takes any attachment and performs any operation possible

with a conventional drill . . . plus complete freedom of spindle location. The self-contained power feed can be actuated manually or by solenoid for simultaneous or sequential operation.

MAGNA DRILL can be changed quickly from one setup to another *without special tooling!*

MAGNA DRILL duplicates the economies of elaborate, custom-built, multi-spindle machines. Yet it is so adaptable that even short runs can be produced at amazingly low costs. Where tumble jigs are used, savings are even more impressive, since all holes can be drilled at the same time.



As a single, gang, or multi-spindle unit, MAGNA DRILL is a rugged, precision, production tool. Enclosed drive adds to safety. Adjustable throat and angular freedom increase versatility.

## SEE MAGNA DRILL DEMONSTRATED!

It can perform almost any drilling, tapping, reaming, counter-boring, or similar operation! Just fill out and mail the coupon for complete literature.

## SPECIFICATIONS

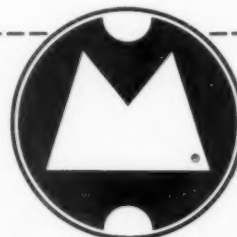
Capacity: in steel	3/4"
in cast iron	1"
Stroke	5"
Throat (variable)	drills to center of 28" circle
Spindle speeds: 1800 rpm. motor	380 to 3430 rpm.
3600 rpm. motor	760 to 6860 rpm.
Power feed rates	.003", .005", .008", .012" per rev.
Motor recommended	1 hp.

## MAGNA ENGINEERING CORPORATION

Dept. 236-K at factory nearest you:  
12819 Coit Rd., Cleveland 8, Ohio, or  
Menlo Park, California

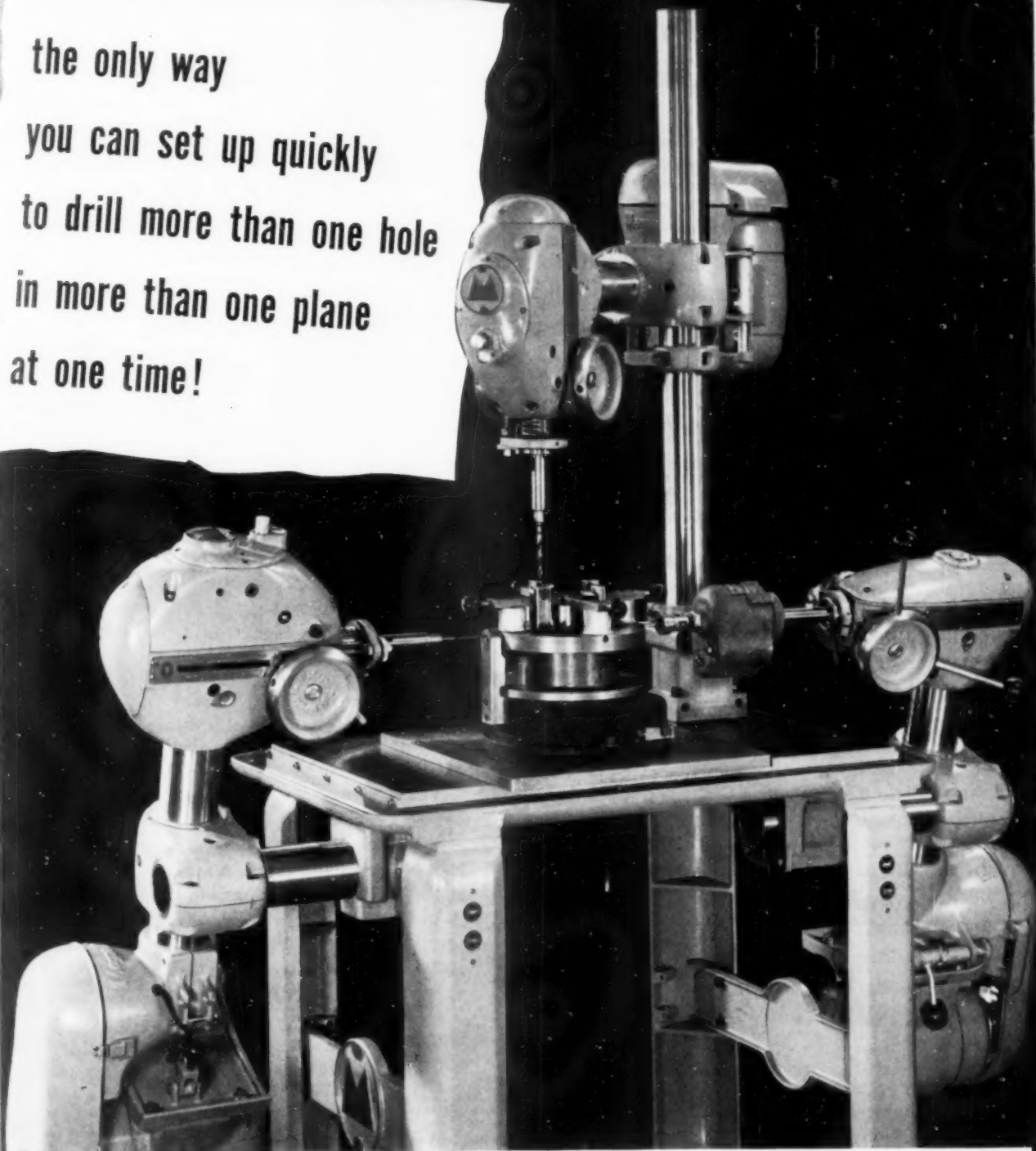
- ☐ Please send me more information about MAGNA DRILL.  
☐ Have a representative call.

Name \_\_\_\_\_  
Position \_\_\_\_\_  
Company \_\_\_\_\_  
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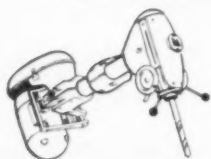




the only way  
you can set up quickly  
to drill more than one hole  
in more than one plane  
at one time!



# 1001 QUICK SETUPS POSSIBLE WITH MAGNA DRILL MODULAR COMPONENTS



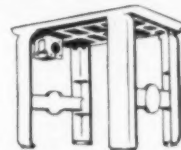
**Drill Heads** Standardized, adjustable heads can be indexed and locked at any angle or position *without special tools*. Variable throat. Right or left hand feed. \$265\*.



**Columns and Bases**  $\frac{3}{4}$ " walls.  $3\frac{1}{2}$ " precision-ground tubes support drill heads. Column bases are cast iron, line bored; can be mounted horizontally or vertically. \$45\*.



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**Tables** Drilled and tapped for mounting heads in variety of positions, and for ganging tables in multiples. Single table, 24" x 20", \$170\*. Double table, 24" x 40", \$220\*.

\*DELIVERED TO YOUR PLANT

# American Society of Tool Engineers

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Because of the extraordinary growth of the Society, ASTE members have been receiving only those data sheets of most recent issue. To correct the situation the National Standards Committee has prepared with the help of manufacturers to reproduce as many as possible of the data sheets issued under the Numerical System instituted in 1946. Listed here are those data sheets that have been processed through the reprint program to date.

**Members may at no charge obtain a copy of any of the listed data sheets should they be missing from their binders.**

**A handling charge is made to non-members who may wish copies of these sheets.**

Please indicate by a check mark those required.

<i>Index No.</i>	<i>Company or Organization</i>	<i>No. of Sheets</i>	<i>Index No.</i>	<i>Company or Organization</i>	<i>No. of Sheets</i>
09-54000	Industrial Diamond Association of America, Inc. ....	17	34-91129	Carboloy Dept. General Electric Company .....	1
25-78900	Hardware Products Company .....	1	34-91210	Link Industries .....	1
25-92000	The American Brass Co.— American Metal Hose Branch....	3	34-91231	Gairing Tool Company .....	1
25-92000	American Metal Hose Branch of The American Brass Co. ....	3	34-91232	Gairing Tool Company .....	1
25-94310	Bristol Company .....	1	34-91233	Gairing Tool Company .....	1
31-83112	Bunting Brass & Bronze Company ..	4	34-92130	Pivot Punch and Die Corporation..	1
34-43000	V & O Press Company.....	6	34-92190	Carboloy Dept. General Electric Company .....	1
34-51181	Lincoln Electric Company .....	1	34-93010	Scully-Jones & Company.....	1
34-61120	Wilson Mechanical Instrument Co., Inc. ....	1	34-93012	Scully-Jones & Company.....	1
34-73134	Gatco Rotary Bushing Company ...	1	34-93030	Davis Boring Tool Division (Giddings & Lewis Machine Tool Co.) .....	2
34-91000	Carboloy Dept. General Electric Company .....	2	34-93030	Gairing Tool Company .....	1
34-91040	National Twist Drill & Tool Company	6	34-93052	Sturdimatic Tool Company .....	1
34-91047	Connor Tool and Cutter Company...	3	34-93064	Scully-Jones & Company.....	1
34-91048	Gairing Tool Company .....	1	34-93068	Scully-Jones & Company.....	1
34-91050	National Twist Drill & Tool Company	7	34-93072	Gairing Tool Company .....	1
34-91076	Gairing Tool Company .....	1	34-93078	Scully-Jones & Company.....	1
34-91080	National Twist Drill & Tool Company	2	34-93170	Giddings & Lewis Machine Tool Co.	1
34-91124	Carboloy Dept. General Electric Company .....	3	34-93190	Scully-Jones & Company.....	1
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NATIONAL STANDARDS COMMITTEE, Dept. 2  
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WHAT'S THE MOST  
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See page 9

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THE  
FOUR GOOD STEPS?

See page 3 ▶▶▶

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PAINT**

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metal where a steam supply is available? See page 5.

What's the best when steam is not available? See page 7.

What is the cheapest way to strip metal parts in large  
volume? See page 9.

What are the best ways to prepare stripped surfaces for re-  
painting? See page 11.

What strippers are best for removing oil-base paints?  
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other soils \_\_\_\_\_

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COMPANY \_\_\_\_\_

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# Index of The Tool Engineer Advertisers

February, 1953

The index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

## ♦User of ASTE Data Sheets

A	
♦Acme Industrial Co.	162
Acme Tool Co.	178
Adamas Carbide Corp.	135
Allegheny Ludlum Steel Corp.	148
Allen Mfg. Co.	181
Allied Air Parts	13
Aluminum Company of America	186
American Broach & Machine Company, Division of Sundstrand Machine Tool Co.	161
American Chain & Cable Co., Campbell Machine Division	215
Wilson Mechanical Instrument Division	178
American Society of Tool Engineers	202-222
Ames, B. C., Co., The	122
Ames Precision Machine Works	200
Amlintool, Inc.	139
Anderson, F. E., Oil Co.	126
Armour and Co.	133
Armstrong-Blum Mfg. Co.	118
Arter Grinding Machine Co.	129
B	
Balas Collet Mfg. Co.	226
Baumbach, E. A., Mfg. Co.	225
Bay State Abrasive Products Co.	179
Bellows Co., The	138
Besly-Welles Corp.	204
Bethlehem Steel Corp.	145
♦Boyar Schultz Corp.	166
Bryant Chucking Grinder Co.	14-15
Bryant Machinery & Engineering Co., The Smith & Mills Co., Affiliate	149
Bullard Co., The	219
Buol Machine Co.	184
Butterfield Division, Union Twist Drill Co.	193
C	
Cadillac Stamp Co.	172
Campbell Machine Division, American Chain & Cable Co.	215
Carborundum Co., The	146-147
Card, S. W., Division, Union Twist Drill Co.	169
Cardinal Machine Co.	216
Carlton Machine Co.	210
Chicago Rivet & Machine Co.	208
Cincinnati Shaper Co.	22
Cleveland Instrument Co.	134
Collins Microflat Co.	162
Columbia Tool Steel Co.	109
Cone Automatic Machine Co.	177
Cosa Corp.	32-33
Cross Co., The	36
Crucible Steel Company of America, Tool Steel Division	211
Cushman Chuck Co.	203
D	
Danly Machine Specialties, Inc.	155-163
♦Delta Power Tool Division, Rockwell Mfg. Co.	150
Denison Engineering Co.	188
Detroit Die Set Corp.	119
Detroit Reamer & Tool Co.	206
Detterbeck, Geo. L., Co., Inc.	200
Diamond Products, Inc.	109
DoAll Co., The	196-197
♦Dumore Co., The	127
Dykem Co., The	162
E	
Eastern Machine Screw Corp., The	154
Eastman Kodak Co.	23
Engis Equipment Co.	121
Ex-Cell-O Corp.	Inside Back Cover
F	
Federal Products Corp.	185
Fellows Gear Shaper Co.	202
Foot-Burt Co.	194
Fuller Tool Co.	214
G	
Galland-Henning Mfg. Co.	214
Gammons-Hoaglund Co.	172
Gerotor May Corp.	212
Gisholt Machine Co.	17-18-19-20
Glenzer, J. C., Co.	200
Gorham Tool Co.	113
Graymills Corp.	115
Greer Hydraulics, Inc.	94
Grobet File Company of America	208
H	
Hammond Machinery Builders, Inc.	110
Hannifin Corp.	10
Hardinge Brothers, Inc.	5
Hartford Special Machinery Co.	165
H. E. B. Machine Tools, Inc.	160
Heald Machine Co., The	Inside Front Cover
Hisey-Wolf Machine Co.	112
I	
Illinois Tool Works	209
♦Industrial Diamond Association of America, Inc.	114
Interstate Tool Co.	96
J	
Jahn, B., Mfg. Co.	120
Jarvis, Charles L., Co.	116-117
Jessop Steel Co.	151
♦Jones & Lamson Machine Co.	171
K	
Keller Tool Co.	106
Kennametal, Inc.	95
Kobel Diamond Tool Co.	93
L	
Landis Machine Co.	8
Lapoint Machine Co., The	12
Latrobe Steel Co.	199
Lavallee & Ide, Inc.	103
Lee, K. O., Co.	172
Lindberg Engineering Co.	205
Littell, F. J., Machine Co.	154
Lodding, Inc.	131
Logansport Machine Co., Inc.	167
Lovejoy Tool Co.	104
M	
Machine Products Corp.	178
Magna Engineering Co.	220-221
Metal Carbides Corp.	162
Meyers, W. F., Co.	166
Michigan Tool Co.	158-159
Micrometrical Mfg. Co.	98
Miller Motor Co.	201
Milne, A., & Co.	191
Moline Tool Co., The	178
Morey Machinery Co., Inc.	162
Morse Twist Drill & Machine Co.	26-27
Morton Machine Works	125
Motch & Merryweather Machinery Co., The	128
N	
National Broach & Machine Co.	157
♦National Twist Drill & Tool Co.	6-7
Nelco Tool Co., The	92
Newage International, Inc.	208
Niagara Machine & Tool Works	28-29
Nilsson Gage Co.	88
Nobur Mfg. Co.	184
Norton Co., The, Abrasive Grain Division	207
Abrasive Grinding Wheel Division	24-25
O	
Oakite Products, Inc.	223
Ohio Crankshaft Company, Tocco Division	34
OK Tool Co.	213
O'Neil-Irwin Mfg. Co.	107
Ortman-Miller Machine Co.	89
Osborn Mfg. Co., The	21
Ottomiller, W. H., Co.	178
P	
Parker-Kalon Corp.	174
Parker Machine Co.	214
Parker-Majestic, Inc.	136
Pioneer Tool & Engineering Co.	115
Pope Machinery Corp.	11

Portage Double Quick Tool Co. ....	91
Potter & Johnston Co., Subsidiary of Pratt & Whitney Division.	
Niles-Bement-Pond Co. ....	30-31
Precise Products Corp. ....	89

## R

R and L Tools, Inc. ....	170
Rahn Granite Surface Plate Co. ....	202
Richards, J. A., Co. ....	208
Rivett Lathe & Grinder, Inc. ....	195
Rockwell Mfg. Company, Delta Power Tool Division. ....	150
Russell, Holbrook & Henderson, Inc. ....	141
Ruthman Machinery Co. ....	216

## S

Scherr, George, Co., Inc. ....	154
Scully-Jones & Co. ....	156
Sentry Co., The. ....	123
Service Machine Co. ....	216
Sheffield Corp. ....	Back Cover
Simonds Abrasive Co. ....	100
Simonds Saw & Steel Co. ....	16-218
Size Control Co. ....	189
Solar Steel Corp. ....	140
Standard Gage Co., Inc. ....	4
Standard Pressed Steel Corp. ....	176
Standard Tool Co. ....	143
Steel Products Engineering Co., The. ....	111
Stocker & Yale, Inc. ....	97
Stokerunit Corp. ....	142
Stokvis-Edera & Co., Inc. ....	190
Smart, D. A., Oil Co., Ltd. ....	173
Sun Oil Co. ....	2
Sundstrand Machine Tool Company, American Broach & Machine Co., Division. ....	161
Super Tool Co. ....	130
Swartz Tool Products Co., Inc. ....	184

## T

Taft-Peirce Mfg. Co., The. ....	182
Thompson Grinder Co. ....	175
Tietzmann Tool Corp. ....	216
Timken Roller Bearing Co., The. ....	164
Tomkins-Johnson Co., The. ....	132

## U

Union Twist Drill Co. ....	187
Butterfield Division. ....	193
Card, S. W., Division. ....	169
U. S. Drill Head Co., The. ....	105
U. S. Hoffman Machinery Corp. ....	202
Universal Engineering Co. ....	168

## V

Van Keuren Co., The. ....	198
Visi-Trol Engineering Co. ....	137

## W

Wade Tool Co., Inc. ....	9
Waldes-Kohinoor, Inc. ....	217
Wales-Strippit Corp. ....	144
Walker, O. S., Co., Inc. ....	166
Walsh Press & Die Co. ....	183
Warner & Swasey Co., The. ....	152
Waukesha Tool Co. ....	99
Wendt-Sonis, Inc. ....	108
Wesson Co. ....	153
Whistler, S. B., & Son, Inc. ....	124
Wiedemann Machine Co. ....	192
Wilson Mechanical Instrument Division, American Chain & Cable Co., Inc. ....	178
Winter Brothers Co., Division of National Twist Drill & Tool Co. ....	6-7

## Y

Yoder Co., The. ....	180
----------------------	-----

## Z

Ziegler, W. M., Tool Co. ....	225
-------------------------------	-----

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New York 17, New York

### OHIO

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Berea, Ohio

### CENTRAL

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Phone: University 4-7300  
Detroit 21, Michigan

### WESTERN

Stanley F. Girard  
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Phone: Michigan 2-4465  
Chicago 11, Illinois

### PACIFIC COAST

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**W. M. ZIEGLER TOOL COMPANY**  
13574 AUBURN DETROIT 23, MICH.



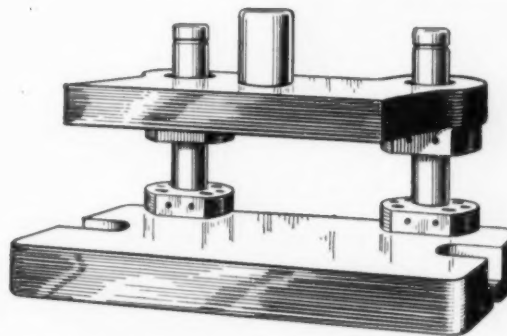
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February, 1953

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The OLDEST Die Set Manufacturer

The NEWEST Die Set Design

USE READER SERVICE CARD; INDICATE A-2-225-2

225

THE  
*Cattleya Jupiter*  
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its

**BALAS**

True-running, long-lasting Balas Collets are built to exacting specifications, guaranteeing efficient performance on short or long run jobs. You can obtain maximum economy of operation with resulting savings in labor and material by using Balas Collets. They are vital in helping you get continuous, peak production of accurate parts on your lathes and automatics. Balas Collets are being used today in more plants than ever before...specify them for your machines today!



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**WORLD'S LARGEST MANUFACTURER OF COLLETS EXCLUSIVELY**



**BOOST PRODUCTION...  
MAKE DIFFICULT PARTS**

*Interchangeable*



Above: Broaches, consisting of five individual sections mounted in each holder, rough and finish two complete parts per stroke.

Below: Two-station, cam-type clamping fixture guides broaches throughout the cutting stroke.

Parts before and after broaching.

**Continental**

**BROACHES BY**

The half-round slots in these stainless steel aircraft tubing clamps were formerly drilled and reamed. The process was slow. To make matters worse, no two parts were exactly alike.

Continental engineers designed broaches and fixture to do a completely uniform job in far

less time. Parts are now fully interchangeable.

For information on how Continental Broaches may help increase your production, with improved accuracy and finish, call in your local Ex-Cell-O representative, or write, wire or phone Continental in Detroit today.



MODEL ACB

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**4 IN 1**  
**SELF-OPENING**  
**DIE HEAD**

The new Murchey Self-opening Die Head is a versatile tool.

- ① Cuts machine screw threads— $3/32"$  to  $6"$
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- ③ Used as a rotating tool on automatic screw machines or drill presses
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Fifteen sizes available

Write for Murchey Catalog MU-1052

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